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Rheumatoid Hand. Physical Therapy Following Insertion of Flatt Prosthesis — FLATT and POWERS

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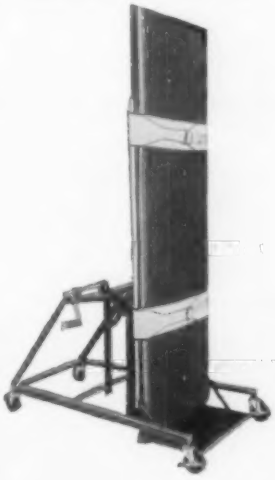

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Physical Therapy Review

October 1961
Vol. 41 No. 10

Published monthly by the American Physical Therapy Association, 1790 Broadway, New York 19, N. Y. *Change of address:* Notice should include old as well as new address and should state whether or not change is permanent. *Subscription rates:* $7.00 per year to non-members; $8.00 in Canada and foreign countries. Re-entered as second class matter August 11, 1949 at the post office at New York, N. Y., under the act of Congress of Aug. 24, 1912.

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VOLUME 41 OCTOBER 1961 NUMBER 10

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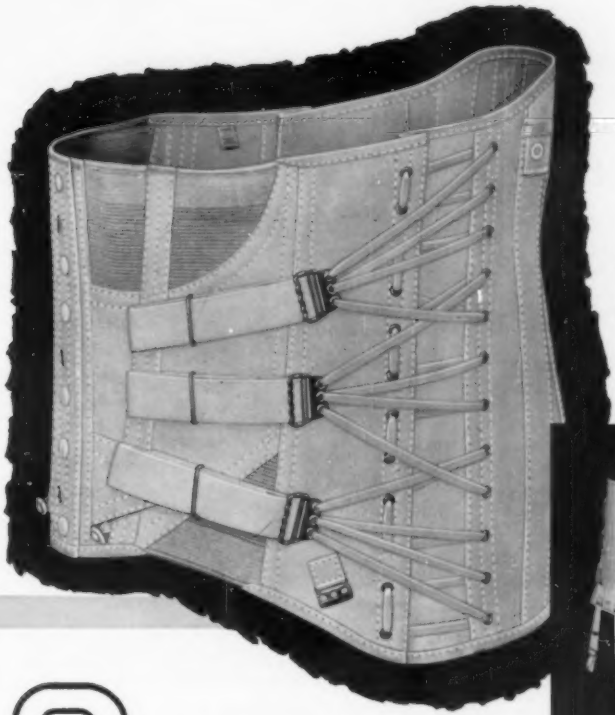

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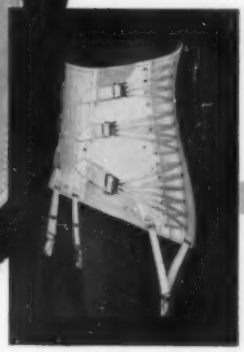

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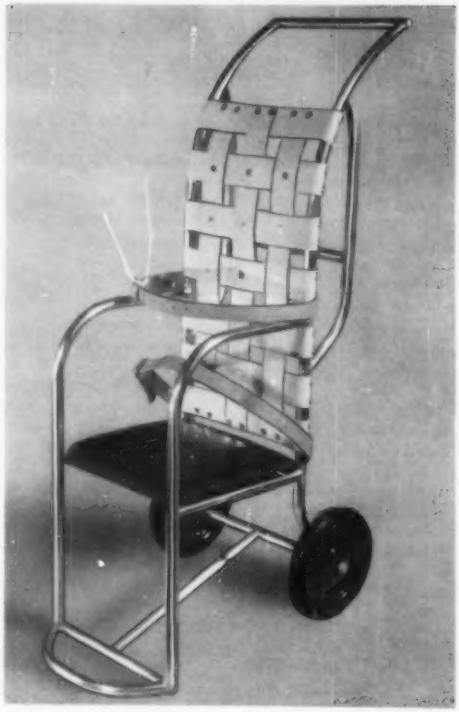

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New York: Semiannual exams, June and Dec. File 30 days in advance. Graduates of registered curriculum apply to John W. Paige, Chief, Bureau of Professional Examinations and Registrations, 23 S. Pearl St., Albany 7; graduates of non-registered curriculum apply to Robert C. Killough, Jr., Assistant Commissioner for Professional Education, 23 S. Pearl St., Albany 7. Exams in Syracuse and New York City.

North Carolina*: Semiannual exams. Apply to Edith M. Vail, Sec., Examining Committee of Physical Therapists, Dept. of Physical Therapy, N. C. Baptist Hospital, Winston-Salem.

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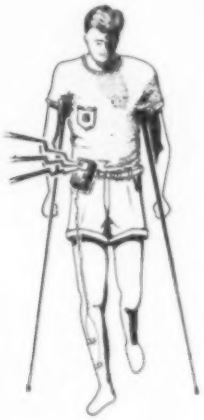

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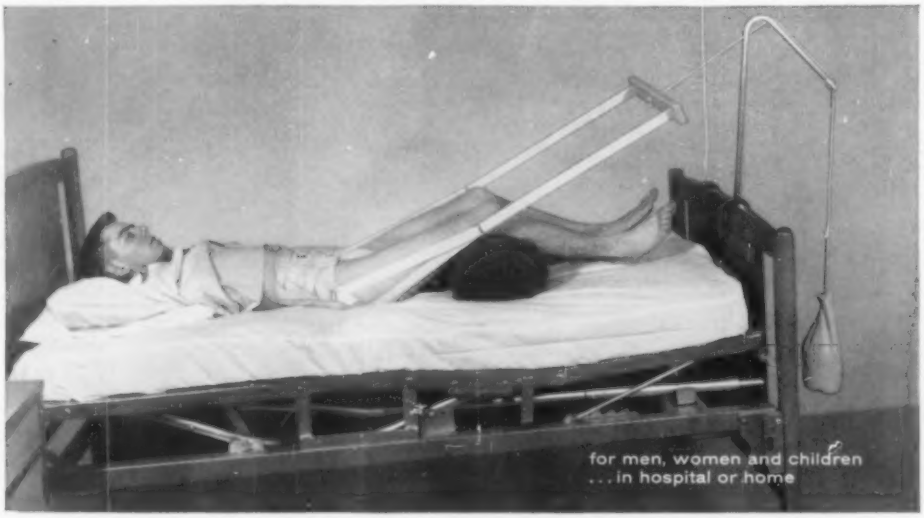

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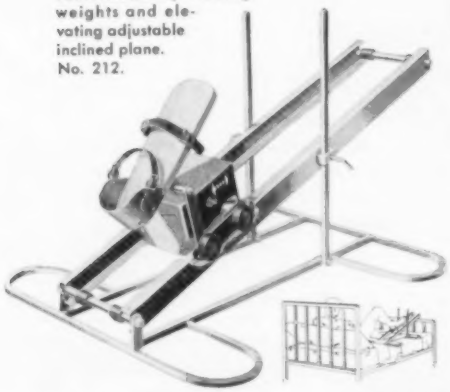

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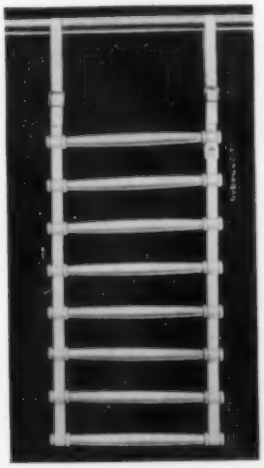

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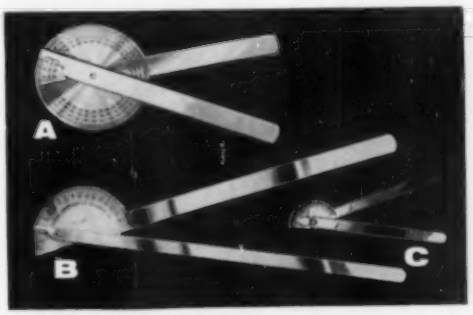

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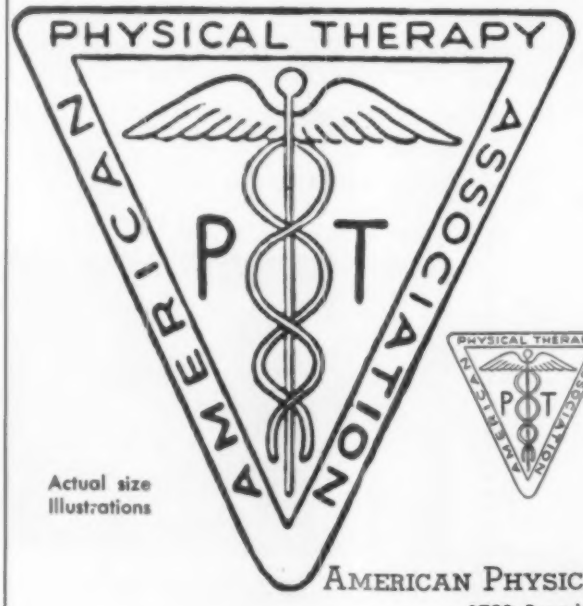

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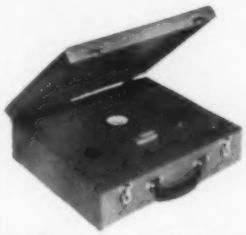

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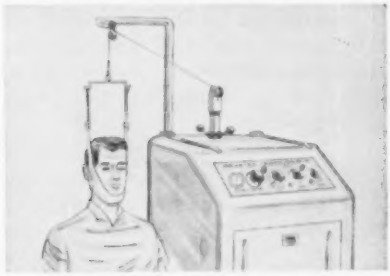

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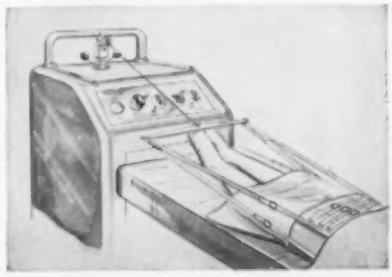

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Pigskins are flying across the country . . . the season of strains, sprains and muscle pains. I wish I could be a football star again (I wished I could once before, too!) But, I want to talk about something besides myself for awhile.

During the past summer I talked with a number of physical therapists about a rather peculiar phenomenon that has been occurring in a few physical therapy installations around the country over the years.

This phenomenon is simply that there are a few locations where, after having been sold on the therapeutic technics of ultrasonics, have given up or discarded diathermy altogether.

I can't help but feel that this is a serious mistake . . . and one that we in the profession should take steps to counter-act. To begin with, there are some conditions where short wave diathermy is very effective while ultrasonics is not. Pleurisy is one that comes to mind right away. The wonderful relief afforded by the deep heat of an induction drum cannot be matched by any other physical therapy measure . . . and certainly not by ultrasonics, which has no effect on pleurisy.

Bronchitis is another condition where diathermy is superior. Many types of muscle strains, sprains and dislocations respond much better to short wave diathermy than to ultrasonics. So do many genito-urinary conditions.

But the real issue is not which one is better nor which one is the method of choice, except in a very few specific treatments. For, never before in Physical Therapy, have two modalities so well complemented each other as short wave diathermy and ultrasonics. (And, even though I'd rather take a whipping than say it, whether they're made by us or our competitors!)

Physicians who have pushed aside their trusted old short wave diathermy for the sake of newer ultrasonic apparatus are simply overlooking a formidable combination. Some ask us which therapy to use first. There is no absolute clinical advice to fit all circumstances, but we favor getting the circulation started and relaxing the spasm by means of diathermy . . . then applying ultrasonics locally and neurotropically (when feasible).

Always low levels . . . always respecting patient tolerances and comfort with both therapies. Some physical therapists add a half-hour under infra-red following both applications.

The combination treatment is not only effective in a great many rebellious or tough conditions, but is also impressive to the patient, is likely to improve his morale, and he is apt to establish a favorable psychological response because of the extent of personal attention received.

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Articles

Rheumatoid Hand

Physical Therapy Following Insertion of Flatt Prosthesis

Adrian E. Flatt, M.D., F.R.C.S.,* and
Whitney R. Powers, M.S.†

The Flatt prosthesis is an articulated metallic hinge (Fig. 1, *left*) which is placed as a substitute for grossly destroyed or dislocated digital joints of the rheumatoid hand (Fig. 1, *center* and *right*). Most of these joints have not been mobile for many years and their controlling muscles are necessarily in very poor condition. The objects of physical therapy are to provide and maintain active power for the prosthetic joints. During the preoperative period, the therapists spend considerable time getting acquainted with the patient and explaining the purpose of the program. Prior to surgery, a hand evaluation is carried out. This evaluation consists of goniometer measurements of all the digital joints during active and passive flexion and extension movements. The amount of ulnar drift of the digits is also measured, as well as the amount of wrist flexion, extension, radial deviation, and ulnar deviation. These readings are subsequently recorded on a chart which has been designed for ease of comparison over a long follow-up period (Fig. 2). The physical therapy program will vary according to the location and number of prostheses inserted.

Metacarpophalangeal Prosthesis

Patients with prosthetic replacement of this joint come back from the operating room with the joints fully supported in extension. Usually a palmar plaster slab is used but bandaging alone is sometimes sufficient. Seven to ten days after surgery this support is changed to a palmar disc (Fig. 3A) to maintain the functional position of the hand when it is not being treated. This half disc is attached to a ¼ inch board which is placed under the full length of the forearm, thereby maintaining the wrist in extension and the fingers in slight flexion. This board and disc also maintain the corrected anatomical position for the phalanges and prevent them from going into extreme flexion, extension, or ulnar drift (Fig. 3B).

The hand is inspected by the surgeon twenty-four and forty-eight hours after the operation and when all signs of immediate reaction to surgery have settled, electrical stimulation is started to the extrinsic extensor muscle groups. This can usually be started within forty-eight hours. Any bandages are cut through to allow good contact and the splinting is held in place by a removable bandage. The therapy is centered around the stimulation of the extensor digitorum communis, extensor indicis proprius and the extensor digiti quinti muscles.

Location of the basic motor points is carried out by the use of a continuous alternating current, with a make and break key to control the stimulus. Following the location of the basic motor points, a surging alternating current is used to initiate an isometric contraction in the extrinsic finger extensor muscles. Isometric contraction is necessary because digital movement is restrained by the bandages and cast until the early healing phase is complete. Four to five days later, when an isotonic contraction is feasible, the extension motion in the metacarpophalangeal joint is initiated by positioning the metacarpophalangeal joints in flexion over the edge of a table (Fig. 3C) with stabilization by the therapist on the wrist and metacarpal bones. If a satisfactory motion is not being obtained, the extensor tendons are put on more severe stretch by placing the wrist in flexion over the table edge (Fig. 3D) with stabilization by the therapist as in the above procedure.

As the motion begins to be more satisfactory, the hand is repositioned as described in Fig. 3C.

* Associate Professor of Orthopedic Surgery, State University of Iowa, University Hospitals, Iowa City, Iowa.
† Assistant Chief of Physical Therapy, University Hospitals, State University of Iowa, Iowa City, Iowa; Instructor, College of Medicine, School of Physical Therapy, State University of Iowa, Iowa City, Iowa.

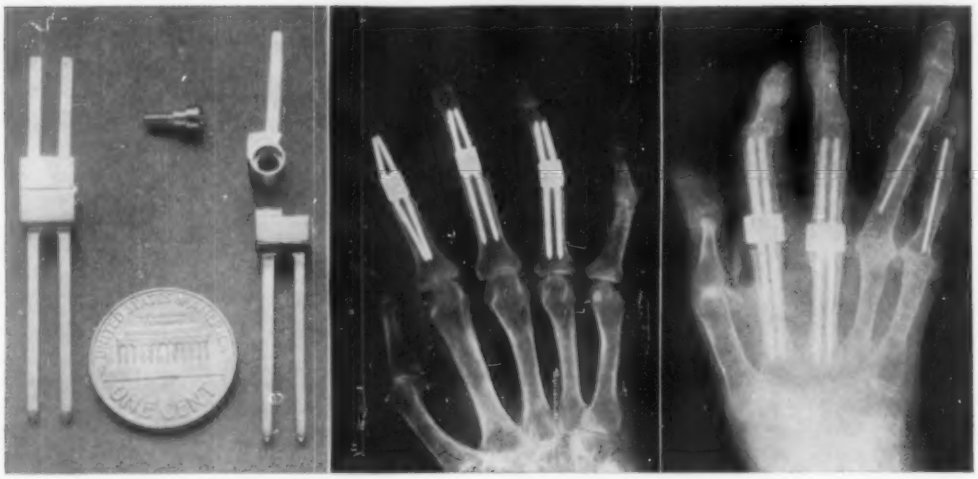

FIG. 1. Left, an interphalangeal joint prosthesis compared for size to a coin. Four different sizes are available to fit the bones of both male and female hands. *Center*, Three interphalangeal prostheses in a woman's hand. *Right*, two metacarpophalangeal prostheses in a different patient's hand; note in the latter patient that fusions previously were performed at another hospital on the interphalangeal joints of the ring and little fingers.

The wrist and metacarpal stabilization by the therapist will rule out the extensor action of the common wrist extensor muscles (extensor carpi ulnaris, extensor carpi radialis longus and brevis), and the synergistic wrist extensor help of the finger extensor muscles (extensor digitorum communis, extensor indicis proprius and the extensor digiti quinti). The digital extensor muscles can now act fully as finger extensors, with the main action taking place at the metacarpophalangeal and proximal interphalangeal joints.

As the patient begins to gain the feeling of the specific muscles used for finger extension, he or she is encouraged to actively assist the contracting action of the electrical stimulus. Gradually, as the patient gains more voluntary motion and strength, the intensity of the electrical stimulus is decreased proportionally until the patient is actively performing the motions independent of the electrical stimulus.

PROXIMAL INTERPHALANGEAL JOINT PROSTHESIS

Patients with middle joint prostheses are supported postoperatively with the fingers and wrist joints in complete extension (0°) by means of a half cast covering the entire volar surface of the forearm, extending to slightly beyond the terminal phalanges. Small elevated sides are present on both the radial and ulnar edges of the cast starting at the wrist, extending to the end of the cast. These elevations prevent displacement of the corrected position of the fingers during the primary healing stage. After seven to ten days, the half cast is replaced by the half disc described earlier (Fig. 3A).

Again, as in the case of the metacarpophalangeal joint prostheses, electrical stimulation is started as soon as the patient begins physical therapy (twenty-four to forty-eight hours postoperatively). The extensor digitorum communis, extensor indicis proprius and the extensor digiti quinti are stimulated to re-educate the patient's proprioceptive centers and to initiate motion in the corrected joints as previously described under metacarpophalangeal prostheses. In this type of prosthesis, the wrist does not have to be flexed over the table edge. Instead, the proximal interphalangeal joints are flexed over the table edge (Fig. 3E) and stabilization is applied by pressure over the wrist and proximal phalanges. This stabilization coupled with stimulation to the localized motor points of the extensor digitorum communis, extensor indicis proprius and extensor digiti quinti muscles, brings about extension of the middle and distal finger joints.

THUMB METACARPOPHALANGEAL JOINT PROSTHESIS

The thumb is responsible for numerous distinctive movements requiring both strength and pre-

RHEUMATOID HAND RESEARCH PROJECT
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			Proximal THUMB			
			Flex.			
			Ext.			
			Distal Flex.			
			Ext.			
			Proximal INDEX			
			Ulnar Drift			
			Flex.			
			Ext.			
			Middle Flex.			
			Ext.			
			Distal Flex.			
			Ext.			
			Proximal MIDDLE			
			Ulnar Drift			
			Flex.			
			Ext.			
			Middle Flex.			
			Ext.			
			Distal Flex.			
			Ext.			
			Proximal RING			
			Ulnar Drift			
			Flex.			
			Ext.			
			Middle Flex.			
			Ext.			
			Distal Flex.			
			Ext.			
			Proximal LITTLE			
			Ulnar Drift			
			Flex.			
			Ext.			
			Middle Flex.			
			Ext.			
			Distal Flex.			
			Ext.			

S
T
A
M
P

WRIST	Pre-op	Post-op	Fol-up
Left	A : P	A : P	A : P
Flex.			
Ext.			
Radial Dev			
Ulnar Dev			

Right	A : P	A : P	A : P
Flex.			
Ext.			
Radial Dev			
Ulnar Dev			

REMARKS

FIG. 2. Chart used for recording goniometer measurements of all the digital and wrist motions during active and passive movements, as well as the amount of ulnar drift of the digits.

cision. Motions of the thumb are complex; however, equal motion occurs at the carpometacarpal and metacarpophalangeal joints.

In the majority of cases affected with rheumatoid arthritis of the hand, the thumb may be severely involved also. The typical clinical appearance is a palmar luxation of the base of the proximal phalanx at the metacarpophalangeal joint, with secondary hyperextension of the interphalangeal joint of the thumb. The proximal phalanx of the thumb is acutely flexed on the metacarpal due to an intrinsic plus deformity exactly similar in etiology to the comparable deformity of a finger.

The thenar muscles, the adductor pollicis, flexor pollicis brevis, opponens pollicis, and the abductor pollicis brevis can be directly involved in the disease. Apart from their general hand activities, these muscles also have a specific influence in flexion of the thumb metacarpophalangeal joint and extension of the interphalangeal joint similar to the lumbricals and interossei muscle action on the digits.

The extreme importance of the kinesiological value of the thumb in all dexterity movements, whether they are classed as power or precision, cannot be overemphasized. In many cases a functional thumb and index finger in a generally incompetent hand is all that is needed to obtain a great deal of function useful for activities of daily living.

Patients with a metacarpophalangeal prosthesis are seen in physical therapy as in the other prosthesis cases. In many instances, the thumb prosthesis is performed at the same time as the other digital surgery.

In these patients, the thumb extensors (extensor pollicis brevis and longus) are stimulated for isometric contractions along with electrical stimulation of the finger extensors in the early healing stage (four to five days after surgery).

Later, isotonic contractions are obtained when

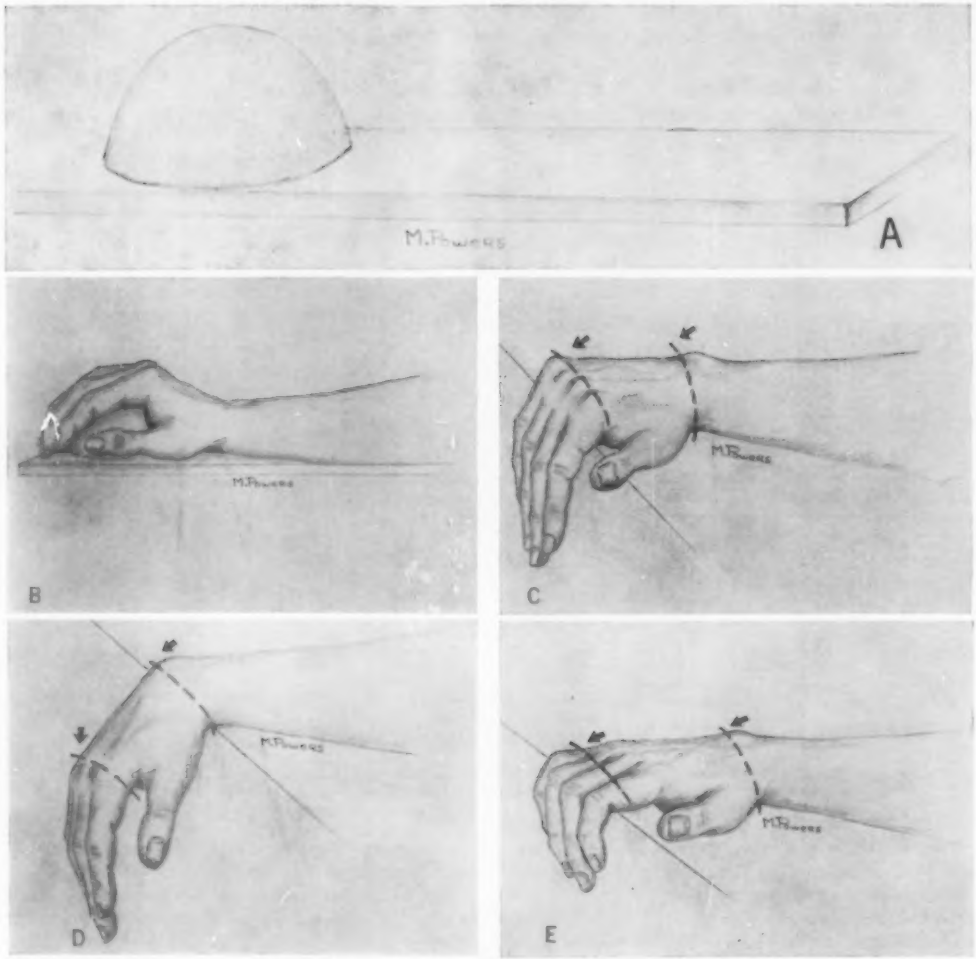

FIG. 3. A, palmar disc attached to ¼ inch board (easily made in the home workshop); B, hand on palmar disc showing maintenance of functional position; C, positioning of metacarpophalangeal joints in flexion over table edge (arrow denotes stabilization sites by the therapist); D, positioning of the wrist in flexion over table edge (arrow denotes stabilization sites by the therapist); E, positioning of proximal interphalangeal joints in flexion over table edge (arrow denotes stabilization sites).

the bandages and cast are removed and gradually the patients assist the electrical stimulus until maximum motions are completely voluntary in both flexion and extension motions of the metacarpophalangeal joint.

In the next phase, exercises are directed for improvement of finger tip and grip prehension.

COMMENTS

Some explanation is necessary concerning the emphasis placed on the stimulation of the extensor muscles of the fingers rather than the flexors. The intrinsic muscles of the hand, dorsal and ventral interossei and the lumbricals are almost invariably involved by the disease. These muscles are usually weak and wasted but in some cases they show such scarring and contracture that the joint deformity known as "intrinsic plus" or "swan-neck deformity" is produced. The normal action of these muscles is to flex the metacarpophalangeal joint and extend the proximal and distal interphalangeal joints. When these muscles

are diseased their paralyzed or distorted action disturbs hand function to such a degree that their action has to be altered to allow restoration of function. This is done by the operation of intrinsic release carried out at the time of prosthetic placement.

In this procedure, the triangular hood of the intrinsics lying on either side of the proximal phalanx of the finger is excised so as to remove the excess flexion of the metacarpophalangeal joint and the hyperextension of the interphalangeal points. Thus, it can be seen that when the extensor component of the intrinsics has been removed from the finger, it is of extreme importance to re-educate and strengthen the extrinsic extensors (extensor digitorium communis, extensor indicis proprius and the extensor digiti quinti) so that these muscles may take over the action of finger extension as much as possible. The degree of contraction of the extrinsic extensors is found to be greatest when the fingers are positioned in a little more than 45° of flexion at the metacarpophalangeal joint. Thus, positioning the fingers in flexion at the proximal joint and stabilizing the wrist to rule out wrist extension anatomically makes it possible for the extrinsic extensors to take over the role of finger extension of the middle and terminal phalanges.

In many cases intrinsic release is not necessary and most of these cases have held their phalangeal joints in semiflexed positions for prolonged periods. Consequently, the flexor muscles have not atrophied to the same degree as the extensor muscles. To balance the muscular pull between the two strong flexors and the extensors, great emphasis must be directed toward the extensor muscles of the fingers until satisfactory strength is gained to warrant exercises to both muscle groups.

Shortly after surgery, the patients may complain of pain in the fingers, hand or wrist. In these instances, paraffin bath treatments are started as soon as the incision area has healed enough to permit immersion in the paraffin (four to five days).

Whirlpool treatments also may be used and are frequently the best postoperative treatment because the patient can exercise the fingers while gaining the benefits of the heat.

A few patients may continue to complain of joint discomfort sometime after the initial surgery and ultrasonic treatment under water may prove beneficial in these cases. Paraffin is preferable in the majority of the cases because, with proper direction, the patient can carry out this procedure at home upon discharge from the hospital.‡

After the patient has gained satisfactory active motion of the prosthetic joints, a home program is set up. Specific exercises are given, but not in the form of progressive resistive exercises. The exercises should consist primarily of domestic procedures for the female patients and are aimed at maintaining range of motion and improving muscle strength. By this means, the risk of losing the productive incentive which is usually encountered with unsupervised formal exercise programs is avoided. An occupational therapist works with the patients on this part of the program prior to their discharge and in many instances throughout their postoperative therapy program. The male patients are given a more directly supervised exercise program to keep their incentive high throughout their rehabilitation and to keep the exercises on a more masculine basis.

In the normal hand, full anatomical range is not necessary to allow virtually full function of the hand and the same is true with any prosthetic joint correction. These patients usually show generalized involvements of the hand and wrist areas and only a few of the total number of joints have been replaced by surgery. Emphasis is, therefore, directed toward increasing strength following the maximum obtainable restoration of joint motion. Both the agonist and antagonist muscles are strengthened, and manual resistance by the therapist has been found to be the best procedure for developing this strength since the amount of resistance can be varied easily according to the advantage angle of a particular joint being treated. Once useful function has been obtained, more difficult tasks are slowly added to complete the rehabilitation program prior to the patient's return to his old occupation or to a new occupation found more suitable for his ability by vocational evaluation. Periodic checks are made by repeating the joint evaluation procedure described earlier in order to follow the patients progress and to make such program changes as the re-evaluation may indicate.

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‡ This department supplies an appropriate booklet for the patient describing how paraffin bath treatments may be carried out at home.

Significance of the Electron Theory of Matter for Physical Therapy

James E. Griffin, Ph.D.*

The electron theory of matter is based upon the fact that all substances, be they gas, liquid or solid, are composed of aggregates of atoms. The individual atom may be regarded as a minute solar system, the sun of which is the nucleus and the planets are represented by electrons orbiting around the nucleus. The nucleus contains a number of tightly packed charged particles, protons, and an equal number of particles carrying no charge, neutrons. The number of particles present in a given nucleus will vary in accordance with its atomic weight. The number of protons may vary from one to 175, always accompanied by a like number of neutrons. The electrons surrounding a given nucleus are negatively charged particles. The number of electrons surrounding a nucleus will vary with the atomic weight of that particular atom and may range from one to more than eighty.

The individual electron represents the smallest known entity of energy. A single electron is thought to have approximately 1/1,800 of the mass of the smallest known nucleus, hydrogen. Considering the mass of an electron, the distance between electrons within an atom is vast, and the distance between the nucleus and any of its atoms is vast. A single entire atom is invisible by any known means. Indeed, it is only recently possible, by use of electron microscopy, that we are able to see the largest known molecule, a protein, which consists of hundreds of thousands of atoms linked together. It has been said[1] that if all the protons, neutrons and electrons contained in your body could be squeezed tightly together they would be barely visible under the highest possible magnification of a light microscope. Be that as it may, the total charge of all the electrons within an atom always equals the total charge of the nucleus when the atom is in its stable state. If the atom has a marked affinity for unstable states, that is it gains or loses electrons easily to other solar systems, then it is of the stuff from which explosions and implosions are made.

A fundamental law of electrostatics is that like charges repel and unlike charges attract. It is this law which keeps electrons in orbit around a nucleus. What keeps the tightly packed charges within the nucleus together is not known. When nuclear charges are separated, an atomic explosion occurs. Addition of tremendous quantities of energy to the nucleus are required before nuclear disruption occurs, far more energy than is required to knock electrons out of orbit. However, atomic explosions are not the topic of this paper. Movement of electrons within their solar system and transfer of electrons from one solar system to another by means of physical agents and the subsequent physiologic effects are of concern to physical therapists.

Movements of Electrons about their Nucleus

Any electron is capable of four different types of motion and commonly is undergoing all four types simultaneously. The only time that an electron is at rest is when its temperature is absolute zero (−273°C., −459°F.). There is translational movement, the movement of an entire solar system from point to point in space, relative to other atoms. For most atoms this is a random rather than patterned movement at temperatures wherein life exists, and becomes patterned only if unidirectional energy is added to the solar system. Secondly, there can be orbital shifting, the movement of an electron closer to or farther away from its nucleus as energy is added or withdrawn from the solar system. The closer an electron is to its nucleus the more energy is required to make it move out of orbit. The converse is equally true, the farther away an electron is from its nucleus the less energy is required for a change in orbit. It then follows that the further away an electron is from its nucleus the easier it is to control its activity with externally added energy. Thirdly, there is movement of the electron in its orbit, which can be either circular or elliptical, and which is constantly fluctuating in minute degree as the multitude of external and internal forces which affect an electron constantly disturb the balance of energy between the nucleus and its electrons. No two electrons within a solar system ever occupy precisely the same orbit, and consequently, no two electrons within a solar system have the same amount of energy. Lastly, there is the motion called orbital spin, wherein the electron is constantly turning about its own axis, just as the

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earth rotates completely once every twenty-four hours. Among the several electrons which may be occupying approximately the same energy level, half will be spinning clockwise, and the other half counterclockwise, usually in pairs at the most distance away from each other that their orbits will permit. If there is an unequal number of electrons, obviously the pairing will be incomplete, and such an atom is slightly more susceptible to external forces than is the atom whose electron pairing is complete. It has been said[2] that this variation in electron spin pairing is a major factor as to whether an object is diamagnetic (forces between atoms or molecules repelling each other) or it is paramagnetic (forces between atoms or molecules attracting each other). Orbital spin is not thought to have appreciable bearing on ferromagnetism, which is probably due to deficiencies in numbers of inner shell electrons.

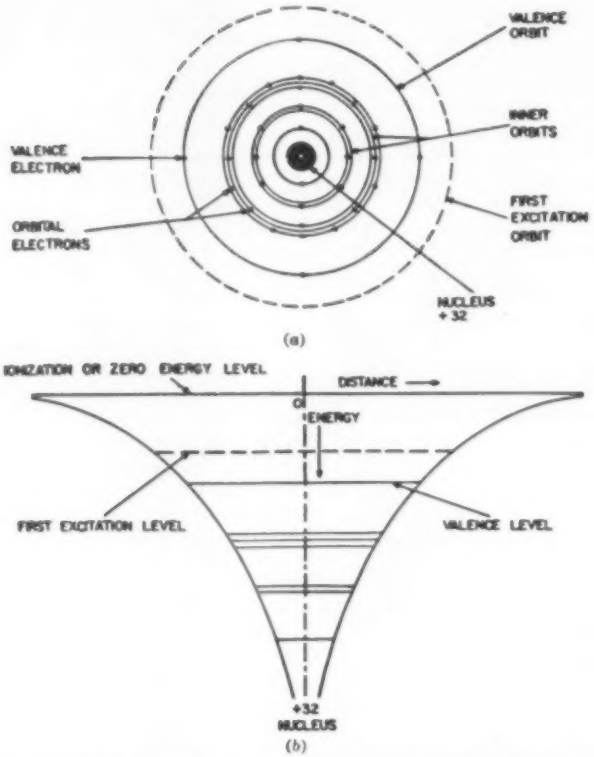
ELECTRON SHELLS

The classic two dimensional schema[3] presents the atom as a nucleus with one or more electrons traveling around it. Those atoms having one or two electrons have only one energy level (Fig. 1). Those atoms having more than two but less than eleven electrons will have two energy levels, and so forth. Regardless of the number of electrons held by a given nucleus, the outermost electrons will be those readily available for transfer to other orbits within their own solar system or for transfer to other solar systems. These outermost electrons are the conduction electrons and travel in conduction bands. If the conduction electrons collide with electrons from other solar systems they absorb energy and become excited. If as a result of collision they are knocked closer to their nucleus and are appreciably excited, they are now in the excitation level of energy and radiate energy. It is such movement of outer shell electrons which normally occurs when atoms are exposed to any form of thermal energy. Electrons which are still closer to the nucleus are valence electrons, that is they are the ones which determine many of the chemical properties of a given element or molecule. A greater amount of energy must be absorbed by them before they will move into another orbit within their own or other solar system. When valence electrons shift orbit they bring about the formation of another compound if they have moved into a new atom, or bring about change in valence of an element if they stay within their own atom. Electrons which make up the innermost orbits around a nucleus, if excited, will radiate energy in still greater quantity and are thought to give rise to x-ray, alpha, beta, and gamma radiation. When this occurs the fundamental characteristics of that atom are altered, either transiently or permanently, depending upon whether the affected electron has moved transiently or permanently into a new orbit. Which has occurred will depend upon the amount of energy absorbed by the electron.

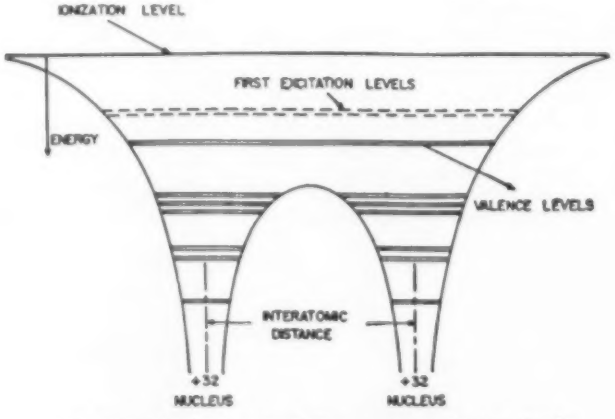
A single alpha particle carries just double the energy of a single electron at the innermost energy level, so that when an alpha particle hits an electron, that electron moves a considerable distance and is not likely to revert to its old orbit. Most physicists think that an alpha particle is an helium atom which has lost all its electrons, making it considerably smaller than an atomic solar system. This size differential gives the alpha particle relatively great penetrating power. Beta and gamma particles are still more powerful. Their structures are not yet fully established.[4]

When an electron is hit it may move to another orbit and may now radiate energy. As it thus sheds this excess energy it moves farther away from its nucleus and eventually back into its resting state orbit. An electron can be knocked temporarily towards its nucleus upon collision with energy on the order of muscle stimulating currents, the diathermies, and infrared radiation. Such an effect requires the absorption of less energy than is needed to separate a diatomic molecule into its component ions, i.e., NaCl into Na^+ and Cl^-. It should be remembered that no literal collision need take place to cause an electron to shift orbit. So long as another charged particle comes to within 1,000 Ångström units of the electron in question, the orbiting electron may absorb enough energy to become excited. This distance is roughly 1,000 times the space occupied by one entire atom. There can also be collision of a free electron or other particle with an atomic nucleus, but here no significant energy exchange takes place because of the great size differential between most nuclei and any single free particle.

If one or more outer shell electrons are removed from an atom, the remaining part has a positive charge and is called a positive ion. If the removed electron becomes attached to another solar system, the receiving atom becomes a negative ion (if it now has an excess of electrons) or a neutral atom (if it now has a balance between nuclear and shell charge). If such an electron loss or gain is permanent, an ionizing radiation has taken place. The only energy level with which physical therapists work which

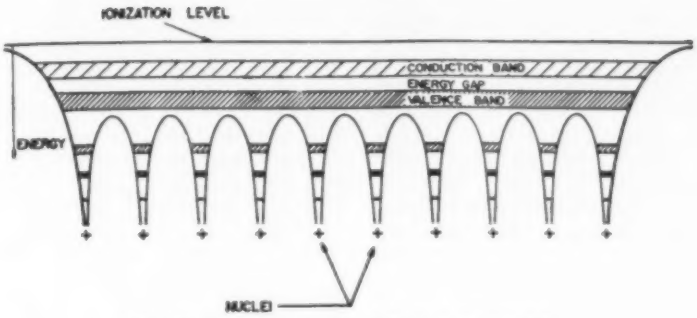


Simplified orbital model of an atom (a) and energy-level diagram of the same atom (b).



One-dimensional energy-level diagram of a diatomic molecule.

FIG. 1. From L. P. Hunter, *Handbook of Semi-conductor Electronics*, 1956, by permission of the publisher, McGraw-Hill Book Co., Inc.



One-dimensional energy-level diagram of a crystal.

FIG. 1. From L. P. Hunter, *Handbook of Semi-conductor Electronics*. 1956, by permission of the publisher, McGraw-Hill Book Co., Inc.

might cause ionizing radiation is that portion of the electromagnetic spectrum designated as ultraviolet. It is true that energy levels which we call muscle stimulating currents also cause ionization, but it is generally agreed that such ionization ceases immediately on cessation of current flow, and therefore a relatively permanent ionization has not taken place. The quantity of energy per unit of time impinging upon individual atoms or molecules was too low to cause any other than transient orbital shift.

INSULATORS, CONDUCTORS AND SEMICONDUCTORS

Individual atoms rarely function as a unit when in the resting state. More commonly they are tightly or loosely linked together with other atoms, either of similar or dissimilar nature, by means of sharing electrons. If a large number of similar atoms are bound together, a crystal is formed and the energy levels of conduction, excitation, valence, and ionization are shared. If the valence band has its quota of electrons and there are no vacant energy levels nearby, it is difficult to change the energy level of any of these electrons. This kind of crystal acts as an insulator. If the energy gap between valence and excitation levels is great there is little possibility that thermal agitation will force electrons from one energy level to another and hence that crystal does not have readily available free electrons. If, on the other hand, the energy gap between valence and excitation levels is small, application of electric current or thermal energy will transfer electrons easily, and that crystal is a good conductor. Metallic conductors are crystals of this class. If the energy gap is such that application of electric current or thermal energy will shift some, but not many, of the electrons from inner to outer energy levels that crystal is a semiconductor.

A common example of a semiconductor is the transistor. Such crystals are extremely pure forms of elements such as silicon or germanium to which have been added minute quantities, on the order of one in 100 million, of other elements such as boron or arsenic. The governing factor is that the added element be of different valence than the matrix element. When these conditions are met and a DC voltage is impressed upon the crystal surface, there will be current flow through the crystal, with exquisite control of the voltage, the valence differential causing patterned movement of electrons through the crystal. If two dissimilar crystals are bonded together, the combination will modify current flow much as does a diode vacuum tube. If two like crystals are linked by a dissimilar crystal, the combination functions much as a triode, but in either case there are many advantages over the ordinary vacuum tube, related to efficient control and utilization of the supplied energy. Transistors are rapidly coming into use in modern muscle stimulating apparatus.

Temperature changes can affect any crystal in at least two ways: first by changing the number of electrons available for conduction and secondly by altering their speed of conduction. Thus, in a conductor with no energy gaps in its electron shell structure at the valence level, the number of electrons available for conduction cannot be changed easily. Here addition of energy will serve only to increase random, rather than patterned motion. Hence, for metallic conductors, as temperature increases the conduction efficiency

decreases. This is known as a positive coefficient of resistance. Semiconductors, on the other hand, have a definite energy gap at the valence level so that many electrons jump from valence to conduction levels as energy is added, the result being that conduction efficiency increases as temperature increases. This is referred to as a negative coefficient of resistance and plays a major role in transistor advantages over vacuum tubes.

When no energy is being added to a crystal, it is in its resting state; all its electrons are in random motion. If energy is then added in a continuous stream, or surged or pulsed unidirectionally, there is created a patterned motion of the crystal's electrons, a current flow. This holds true regardless of whether the energy that is added is conventionally called electric, thermal, ultraviolet, or ultrasonic. Removal of energy from the crystal will also cause patterned electron flow, within certain limits. Application of cold is an example. A solid will be an efficient conductor only if the total current flow can be induced by the addition of small amounts of energy.

Liquids which act as conductors do so solely on the basis of attraction of unlike charges when a potential difference is applied through the liquid. When molecules are so dissociated they do not retain the properties of the resting state atom or molecule.[3, 5] Thus, when we are working with solutions, as in some forms of ion transfer treatment, we will be dealing with polar and non-polar molecules. Polar molecules are those whose atoms are held together by attraction due to asymmetry of the outer electron shell count, i.e., Na^+Cl^-. Non-polar molecules, i.e., H_2 or O_2, are more apt to exist in diatomic rather than compound form, and their electrons usually have parallel spins. Polar molecules will conduct electric energy readily whereas non-polar molecules do not. Polar liquids mix readily with other polar molecules but not with non-polar liquids. Non-polar liquids mix with other non-polar liquids. Water and alcohol are good examples of polar liquids. Fats and oils usually are non-polar and do not mix readily in water or alcohol but would dissolve easily in carbon tetrachloride or ether. Conversely, water or alcohol would not dissolve easily in ether or carbon tetrachloride.

APPLICATION OF THE ELECTRON THEORY TO LIVING MATTER

The background material outlined in the first part of this paper becomes important to the physical therapist if he recalls, from his study of physiology, that each cell has a limiting membrane made up of fats and proteins, which in turn are made up of thousands of atoms in numerous combinations. When the membrane is in its resting state the sum of charges on the inside and outside of the membrane is in balance and little exchange of ions takes place through the membrane.[6] However, when the membrane is exposed to energy, either through normal metabolism or from externally applied sources, this charge balance is altered, at which time ions readily pass through the membrane to and from the cell interior, and the cell performs its function. This change in state of the membrane probably takes place at the ion level and is due, at least in large part, to the movement of electrons within and/or among available solar systems, in any of the ways outlined. The physical therapist guides this movement of electrons by adding to the patient various quantities of energy per unit of time. Certain quantities will cause muscle contraction, other quantities bring about marked vasodilation, and so forth.

The physiologically limiting membrane is on the order of 100 Ängströms thickness and is made up of a lipid core with inner and outer protein layers stabilized by interconnecting peptides.[7] The energy released by breakdown of phosphocreatine accounts for the total electric energy released by discharge.[8] Change in permeability of the membrane is measured as change in ion concentration inside and outside the cell. Bivalent and polyvalent ions are known to exert a far greater effect than are monovalent ions. The membrane contains channels or pores of various sizes, having an average diameter of about 3Å.[6] When the membrane is stimulated the pores transiently increase in diameter. Muscle stimulating currents involve both active and passive characteristics of tissues, cells and membranes, whereas the diathermies and other wave lengths thought to cause only tissue temperature rise involve only passive characteristics.[9] It has been known for years by students of vertebrate physiology that when cells are at rest there is a higher concentration of sodium ions extracellularly and of potassium ions intracellularly and that on membrane stimulation this condition is reversed so that potassium concentration rises extracellularly and sodium concentration rises intracellularly, although not on a one for one basis. Sodium ions are presently thought to be a prime factor in membrane surface charge and chloride ions a major factor in membrane interior charge. The membrane potential difference is on the order of 50 to 100 millivolts.

The mechanics of ion shift across the membrane are not yet resolved. Bernstein was perhaps the first to present a useful working hypothesis[10]: that membranes are permeable to cations but not to anions. It was later shown that such a membrane does not exist in living cells. (See for example Heilbrunn[11], page 56.) Hodgkin and Katz[12] modified Bernstein's theory on the basis of the fact that at the moment of excitation the membrane becomes far more permeable to sodium than it is to potassium and hence a current carried by sodium ions is responsible for the formation of the action potential. Hodgkin[13] has presented a detailed review of the evidence for this viewpoint. This view is probably the one held by most muscle and nerve physiologists at this time, the chief addition to which has been that potassium movement towards cell exterior lags behind sodium movement and that the potassium movement is responsible for the recovery current. (See for example Cole.[14]) The resting potential is not altered by stimuli having a frequency above 100 kc.[25] According to Shanes (op. cit.) such ion movement would be possible in any of four ways: (1) free ion movement through the pores, movement controlled by electric fields at pore surface, in exchange with ions of appropriate charge; (2) exchange diffusion; (3) ion pair diffusion on the basis of concentration gradients; (4) active transport, wherein ions move against concentration gradients. According to Schwan and Cole [25] energy transfer may be from one form to another or one site to another by virtue of: (1) the presence of polar molecules, i.e., molecules whose distribution of positive and negative charges is asymmetrical and which consequently turn with the electrical field; and, (2) the existence of heterogenous structure. If structures are composed of materials having different electrical properties the boundaries separating the different mediums will usually be charged. This is accomplished in many cases through ionic transfer. The fact that the ratio of sodium to potassium ion movement does not balance[15] led to the development of the hypothesis that the K and Na shift should be regarded as an oxidation-reduction (redox) pump triggered by minute temperature change. According to Conway[16, 17] it is supposed that a reductant of a redox system specifically adsorbs sodium ions and when it loses electrons to a second system these are released into solution . . . if the system with the adsorbed sodium ions existed in the membrane transfers its electrons at the outermost edge to another system . . . the electrons can go up the respiratory chain to oxygen or, in the anerobic state be finally received by pyruvic or enolpyruvic acid after linking with hydrogen ions to form lactic acid".

While this sodium pump undoubtedly exists and plays an important role in membrane permeability, study of sodium and potassium movement through the membrane does not offer clues as to the ionic trigger for this chain of events. In the latter 1950's more and more attention was paid to the role of calcium in the control of permeability.[18, 24, 26] Ringer[19] was perhaps the first to demonstrate that, at least in vivo, calcium plays an important role in muscle contraction. Heilbrunn (op. cit.) has brought together much evidence that any known stimulus causes the release of calcium from its binding sites, and that this is true for many types of protoplasm, including muscle and nerve. Shanes (op. cit.) has brought together a large volume of literature showing, among other things, that calcium acts as a membrane stabilizer by virtue of its firm binding capacity with both lipid and protein. Some anesthetics, cocaine for example, and narcotics are also membrane stabilizers but probably do not act at the same site as calcium.

It is now clearly established that if the extracellular calcium concentration is lowered the cell becomes more freely permeable. More recent work[20] has shown that calcium controls membrane surface charge in human erythrocytes and is directly responsible for the degree of permeability of these cells. It has also been shown that the effects of extracellular addition of potassium on muscle contractility are mediated by calcium[21] and that muscle membrane potential is directly dependent upon the extracellular concentration of calcium,[22] rather than on tissue temperature per se. There has been work[23] demonstrating that muscle calcium in frogs is not uniformly distributed, but that when the fiber is at rest calcium is concentrated near the Z line. Depolarization causes the release of calcium with subsequent migration from Z to I band during the latent period, and thence to the A band. Contraction takes place when calcium reaches the A band and at this time calcium, along with protein, is squeezed out, during the shortening of the I band.

Whether such studies can be confirmed or whether they are applicable to mammalian tissues remains to be seen. However, present knowledge of the role of calcium can be safely summed up, as it was by Wasserman[24] by saying that calcium is: (1) an essential element in conversion of prothrombin to thrombin; (2)

necessary in promoting normal cardiac, smooth and skeletal muscle function; (3) essential for the normal functioning of nerve tissues; and (4) implicated in the maintenance of normal intracellular environment and in the the development of bioelectric potential at the cell surface. Heilbrunn (op. cit.) probably has developed the idea that calcium is the key in all stimulus-response situations more extensively than anyone else.

If enough energy is absorbed by the molecules making up the limiting membrane, there will have been a great enough permeability shift to cause a reversible coagulation of the cell interior. If too much energy is impressed upon the membrane, the interior coagulation becomes irreversible and cell death occurs. This normal coagulation phenomenon occurs both in specialized cells such as muscle or nerve, as well as in less differentiated cells such as eggs. When carried to its extreme, such addition of energy gives rise to vacuolization, which has been defined as a form of the well known surface precipitation reaction (Heilbrunn). If the stimulus has been of appropriate size, after the cell has responded by contraction (muscle), secretion (ductless glands) or filtration (renal tubules) the normal resting state membrane potential difference is restored, the cell has recovered, and is ready for the next stimulus.

For frequencies above 100 kc. the cell cannot respond to and recover from each pulse of energy. This will prevent the above chain of events from taking place since time, on the order of microseconds, must elapse for the potential changes, and other changes, to occur. In such a situation the cell will respond, not with orderly process leading to normal function, but with a spontaneous process, i.e., increase in random motion of its molecules and consequently increase in temperature. All of the forms of energy which physical therapists add to their patients, with the exception of muscle stimulating currents, are at or above this frequency. As the frequency becomes higher the amount of energy per unit of time becomes higher, so that when we use energy in the form of ultraviolet light the frequency is sufficiently high to cause spontaneous process and, more importantly, to disturb valence shell electrons and by so doing to break low energy intra-molecular linkages. This sets up chemical chain reactions, some of which are propagated to deeper lying cells, even though, in the case of ultraviolet, initial penetration is complete within 2 mm. It is thought by some that certain of the clinical effects of ultrasonic energy are derived by such a chemical action, aided by initial penetration on the order of centimeters.

If a unidirectional flow of energy is maintained around and/or through a cell being pulsed at such a rate that each pulse acts as a separate stimulus, this constant demand for membrane polarity reversal and the subsequent cytoplasmic changes, would lead to cell death, unless the energy flow were of short duration. Probably nerve tissue would best withstand such an energy flow of long duration, but not the nerve synapse. The actual time requirement for such destruction would vary somewhat depending upon the tissue exposed to the energy and the quantity of energy being absorbed per unit of time. The destructive effect of an almost constantly flowing unidirectional energy is easily seen in patients for whom ion transfer has been prescribed, if the therapist has set the current density too high.

Within the human body there are two tissues which we should regard as insulators: skin and fat. If the skin is hydrated it becomes an efficient conductor and hence presents no serious problem, although there is still debate as to whether hydration permits appreciable energy transmission except through skin appendages, that is the hair follicles plus the sweat and sebaceous glands. For all practical purposes fat cannot be altered in situ to the extent that it becomes an effective transmitter of energy, although recent work, summarized by Tedeschi[27] indicates that there is a live active participating protoplasmic outer layer which has a better blood supply than does skeletal muscle, at least in rats. However, for the physical therapist fat remains an effective insulator, and because of its low specific heat, as we add energy to the fat there is a marked fat temperature rise which is disseminated to the underlying tissues by conduction and convection, so that fat represents no handicap if conversion of any form of energy into thermal energy is desirable. Except in the pathologically obese patient, fat does not interfere with the transmission of electric energy to anything like the extent that dry skin would. The remaining soft tissues of the body are excellent conductors of all forms of energy because of their high water and salt content.

Therefore it is wise to keep the following factors in mind when using physical agents:

1. Muscle stimulating currents will result in physiologic contraction and relaxation if voltage rise or fall is rapid and if the duration of current flow is sufficiently long to act as a stimulus. Nerve fibers constitute a tissue which appears to

be especially adapted for the reception of such pulses and require only a relatively short duration of current flow. However, there is some variability in time requirements among different nerve fibers, partially based on fiber diameter and quantity of myelin immediately surrounding the individual fiber. Muscle fibers are not so adapted and hence require a longer duration of current flow. Here again there is variation among individual fibers, and again this is in part on the basis of structural variation. Hence, if nerve supply to a muscle is impaired, stimulation will have to affect muscle membrane and duration of current flow will have to be longer than if the nerve supply were intact. Therefore, pulses sometimes are effective whereas square or sine waves produce the best results at other times. Sometimes the duration of current flow must be on the order of hundredths of a second rather than a few milliseconds.

2. Thermal energy, in the form of infrared, shortwave, and microwave frequencies, pulse so rapidly that the only possible response is increase in random motion of electrons, atoms, and molecules, with consequent tissue temperature rise. If the quantity of energy per unit of time in these frequency ranges is too great, tissue burns occur.

3. Ultraviolet frequencies represent a quantity of energy per unit of time sufficient to alter the orbits of valence electrons and hence to create compounds not present when the cell is in its resting state. There is usually tissue temperature rise also, but there is always a decided time lag. Hence the temperature change is secondary to the initial chemical reactions. When the radiation source emits 95 per cent or more of its radiation within the ultraviolet frequencies there is no appreciable temperature rise as a primary process. When the source emits appreciable quantities of both ultraviolet and infrared, there is both chemical and thermal reaction by different electrons within individual atoms. However, when one considers that clinical ultraviolet treatments are measured in seconds the atom reaction to the thermal energy is insignificant.

4. Ultrasonic energy, as used clinically, represents radiation of enough energy per unit of time to cause rapid tissue interface temperature rise. Whether the other possible effects from ultrasonic energy stem from this selective tissue temperature rise remains debatable.

SUMMARY

1. Established facts about electrons, their reactions with nuclei and with electrons, are reviewed.

2. Known effects of the addition of energy to all membranes are discussed.

3. Known effects electron movements and known physiologic changes at the cellular level are correlated.

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I can live for two months on a good compliment.—MARK TWAIN

The Physical Therapist's Responsibility to the Lower Extremity Child Amputee

Betty Kitabayashi, B.S.*

Research and service are the primary concerns of the Child Amputee Prosthetics Project (CAPP), at the University of California at Los Angeles.[1] Here, a comprehensive research program encompasses many aspects of the total treatment program for the child with an amputation. The interdisciplinary staff consists of pediatrician, orthopedist, medical social worker, psychologist, prosthetists, engineers, occupational and physical therapists. All work together to afford each child the best care possible. Each discipline reinforces the other, within the realm of its own specialized skills.

This article is concerned with the physical therapist's areas of responsibility, his unique role in the treatment of the child with a lower extremity amputation, and his role in relation to other members of the interdisciplinary treatment group.

The physical therapist's area of responsibility includes much more than gait training. Whereas the adult amputee can be discontinued from the therapist's treatment schedule once he has learned to use his prosthesis, the child cannot. He must be followed closely by all members of the treatment staff over a period of many years. Two reasons for this difference are growth rates, and differences in walking patterns at various developmental levels during the child's growth period. In adults, basic changes occur slowly over a period of months. Changes in children, on the other hand, occur rapidly, in a matter of weeks—often days. The physical therapist must be aware of and prepared for these changes which are an expression of the normal phenomenon of growth.

The young child learns to walk as a result of physical maturation and reflex mechanisms.[2] Preparation for walking begins very early in the child's neuromuscular development. Sitting balance, reciprocal kicking, scooting and crawling are all preparatory steps for independent walking. The phase most important for later prosthesis wearing is two-legged standing balance. It has been the experience of the CAPP staff that a child who does not have two points of support when he begins to pull himself up and attempts to stand has great difficulty achieving the balance and actual reciprocation needed for walking when he receives a prosthesis.

For example, one patient had a right hip disarticulation-type amputation at the age of nine months, due to an embryological sarcoma. He did not receive a prosthesis until the age of one year and seven months. This was nine months after he had begun to stand on one leg and hop about with the aid of a chair for balance. When he received his prosthesis, he seemed to have no concept of two-legged standing. He refused even to attempt to put any weight on the prosthesis, showing a fear of falling. After four weeks of daily treatment by the therapist, and by the parents at home, the child was able to maintain fair standing balance on both legs. It was approximately three months after this standing balance period that the child walked unassisted.

Another patient, who had a congenital right phocomelia, received his prosthesis at the age of sixteen months, when he had begun to pull himself up to a standing position. He used his prosthesis for crawling, standing and eventually walking. Patient B was walking independently in three weeks. The patient received no formalized gait training, but did receive weekly checks on progress in the use of the prosthesis.

At CAPP, the physical therapist has four areas of responsibility in the treatment of the child with an amputation: (1) preparing the child and parents for the use of a prosthesis, (2) training the child to use the prosthesis, (3) preventing deformities, and (4) checking the fit and function of the prosthesis.

Preparing the Child and Parents

It is important that parents be made aware of and understand the importance of alerting the staff when the child begins to exhibit signs of wanting to pull himself up to a standing position. Fabrication of a prosthesis is begun at this time and is applied to the patient as soon as feasible.

Thorough physical examinations, including muscle tests, range of motion tests, roentgenograms, and orthopedic consultations, are given to each child prior to prosthetic fitting. If, at this time, any pre-fitting treatment is indicated, it is begun immediately. The staff is alert

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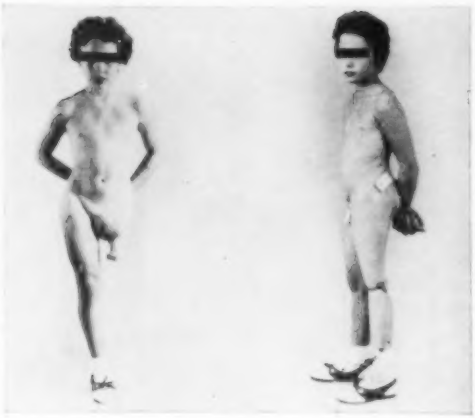

FIG. 1. This nine year old girl with a left phocomelia anomaly utilizes her rudimentary foot to control the knee joint in a modified above-knee prosthesis.

to the possibility of using rudimentary appendanges, not functional for weight bearing, but with some strength that can be utilized to control the prosthesis. A rudimentary foot on a foreshortened leg can be used to control a knee unit (Fig. 1); or it can be used to control an elbow lock for a patient with an upper extemity amputation (Fig. 2).

A majority of patients cared for by CAPP are congenital amputees; hence, the psychological preparation of the parents for acceptance of their child's disability, as well as for acceptance of a prosthesis, is essential.[3] It has been CAPP's experience that the attitudes of parents are the key to the child's acceptance of his disability and to the use of a prosthesis. The physical therapist's training does not necessarily fit him to do this type of preparation, although he may help. The medical social worker, psychologist or physician is the logical person to prepare the child and his parents for the prosthesis. Parents who understand the needs of their child, the treatment plans and their participation in it, and the function of the prosthesis, can be the physical therapist's best allies in the treatment of the child amputee. With good parental understanding, follow up of the training program into the home will be more consistent; appointments for treatment will be kept; the prosthesis will be maintained in good condition; and the child will learn to use his prosthesis much faster. It is well worth the therapist's time and effort to include the parents, and often the siblings, in the training sessions.

TRAINING THE CHILD TO USE THE PROSTHESIS

The Child's Gait Pattern. In recent years, the Prosthetic Devices Study staff at the University of California at Berkeley has been engaged in exhaustive studies of normal adult gait patterns.[4] Information derived from these studies has been valuable to those in the field of prosthetics in improving training techniques and prostheses for the adult amputee. However, it has become increasingly evident to the CAPP staff that some of the information derived from adult studies does not apply to the preschool age child with an amputation. Children of this age group appear to walk differerently from adults. This is evidenced by the fact that scaled down adult components are not always successful with children, and "standard" techniques of alignment must often be altered for them. Since studies similar to those done on adults have not been done on toddiers gait patterns, the observations made have been empirical in nature, based upon clinical observation and experience.

FIG. 2. This eight year old boy, with congenital bilateral shoulder disarticulation amputations and an anomalous, foreshortened right lower extremity, is utilizing his right foot for activation of an elbow lock in his right upper extremity prosthesis.

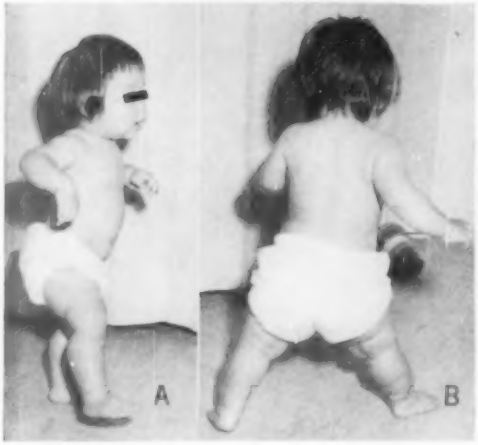

FIG. 3. A, This eleven month old girl has been walking independently for one week. Note the lordotic posture and arms held in abduction. B, The same child from a posterior view showing the wide base of support needed for stability and balance.

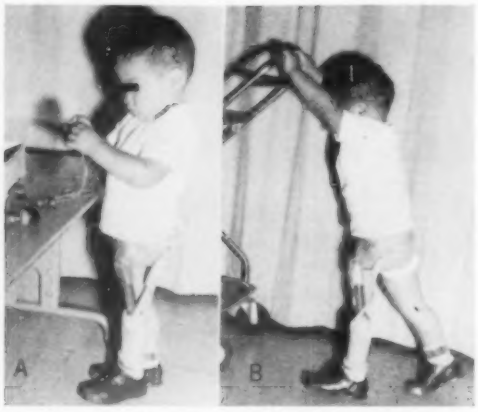

FIG. 4. A, Standing balance is being established with this one year old child. Bilateral toys are used to encourage weight bearing and to discourage using the hands for support. B, This child is learning prosthesis control and a reciprocal walking pattern by pushing a shopping cart.

The toddler's posture most often seen is one in which the back is in lordosis and the legs abducted. The arms are usually held in abduction for added balance. In the swing phase of their step, there is an exaggeration of the flexion of the hip and knee, as well as dorsiflexion of the foot. During the stance phase, the heel-toe transition is usually rapid, giving an almost flat-footed appearance; or they do not have a heel strike at all, but walk on the ball of the foot, using the toes for push-off. Motions are jerky and co-ordination is poor. Loss of balance is common and expected (Fig. 3A and B).

Training Techniques. The amputee training methods advocated by Bryce,[4] Kerr and Brunnstrom[5] are excellent for the child who is able to understand and receive instruction in a formalized treatment session. The very young, preschool child, however, will not tolerate this method of prosthesis training. Therefore, utilization of the child's own sequence of neuromuscular maturation through play activities has proven to be the most effective modality in training him to use the prosthesis. The physical therapist may reinforce and assist the child's developmental responses through suitable play activities.

Balance and reciprocation are the two major skills that the child amputee must learn in order to walk independently. These two skills are normally learned over an indefinite period of time. Each child's developmental pattern is determined by his own rate of maturation. It is difficult to alter this. A child will spontaneously stand and walk when he is neuromuscularly ready, unless he is physically unable to do so as in the case of the amputee child without a prosthesis. Suggested activities that may be useful in training the child to use his prosthesis are listed in Table 1 under the major headings of "Balance" and "Reciprocation." Some of the activities overlap and may serve to encourage reciprocation as well as balance. Some of the suggested activities are also illustrated in Figures 4A and B, and Figure 5.

Equipment such as walkers, harnesses, and parallel bars are not used unless absolutely necessary. The activities used in play are preferred as the child's attention span is much longer and his co-coperation more easily elicited. The same activities may also be done at home in play with parents and siblings.

PREVENTING DEFORMITIES

An important part of the physical therapist's responsibility to the child amputee is the prevention of deformities. The child's growth pattern is easily influenced by external stress.

Improper weight bearing upon a stump or anomalous limb is a frequent cause of deformity. Poor posture habits, improper gait patterns, and contractures often put added stress on tissue, bone, and ligaments not suited for weight bear-

Table I

SUGGESTED ACTIVITIES FOR LOWER EXTREMITY PROSTHETICS TRAINING FOR CHILDREN

BALANCE

CHILD'S SPONTANEOUS RESPONSES	SUGGESTED ACTIVITIES
1. Assisted Standing:	
a) pulling self up to a standing position and holding onto the side of a crib, playpen, table, or chair.	a) placing toys on a table or chair where child must pull self up to a standing position to reach them.
b) standing against a stable object for support while playing with toys.	b) playing with two-handed toys while standing against stable object. Lessen stability of support as child increases his ability to balance.
2. Independent Standing:	
a) one leg at a time.	a) kicking a ball with sound and prosthetic leg while holding onto stable object. Start by allowing child to hold with both hands, then one and eventually independent standing.
b) two-legged standing.	b) throwing and catching a ball.

RECIPROCATION

1. Walking by holding onto or leaning against a stable object.	1. Same as Numbers 1 and 2 under Assisted Standing.
2. Walking by holding onto and pushing against some moveable object or with support from another person.	1. Pushing toy or stroller sufficiently weighted so that it will not roll too fast.
	2. Holding onto therapist's or parent's hands. Some do better with support in front rather than from behind.
3. Independent ambulation.	1. Placing toys on tables or chairs at some distance from each other so child will have to take several independent steps to get to the next object. Distances can be increased gradually.

ing. Skin breakdowns, bony overgrowths, and bowing of the bones are some of the deformities which can occur. Ill fitting, improperly aligned prosthesis may also cause these same deformities.

For example, prosthetic replacement for an adult amputee with a partial amputation of the foot has been relatively simple for the prosthetist, and this type of amputee usually requires little or no training from the therapist. Children who were initially fitted with a smaller version of this adult type prosthesis, subsequently developed an increase in internal tibial torsion, hypertrophy of the fibula, loss of the normal genu valgum of the knee, distortion of the distal tibial epiphysis, and relaxation of the lateral collateral ligaments of the knee. These conditions occured within one to two months after weight-bearing, and continued to increase after prosthetic fitting. A different method of alignment had to be devised by the prosthetist.

Children with congenital amputations and /or anomalies often have muscles which are attached in bizarre ways, causing muscle imbalance and poor leverage. Anomalies in the bony structures and joints are also commonly found. These often cause contractures and joint instability. The phocomelia type anomaly (Fig. 6) is one in which both muscle and bony tissues are anomalous. Simple exercises, that can be done at home with the parents' aid, are often helpful in strengthening muscle groups and preventing contractures. For example: tricycle riding is an excellent activity to strengthen and maintain range of motion in hip extension. The pedal or

FIG. 5. An excellent activity to gain balance, prosthesis and body control is catching and throwing a ball as illustrated by this sixteen month old congenital below-knee amputee.

pedals of the bicycle may be adapted for this illustrated in Figure 7.

Children are adaptable and will often develop good tolerance to discomfort. Therefore, it is not wise to rely on the child's complaints or lack of them. Frequent check should be made for possible occurrence of deformities, or malfunction of the prosthesis. Parents should be instructed to advise the therapist of signs of discomfort and to discuss these with the therapist without overemphasizing them within hearing of the child.

CHECKING FIT AND FUNCTION OF THE PROSTHESIS

The parents and the child, if he is old enough, should be instructed in the appropriate care of the prosthesis. Simple hygiene measures, such as frequent changing of stump socks and cleanliness of the stump and socket of the prosthesis, will add to the life of the prosthesis and will avoid many skin irritations.

Parents should be taught how to recognize signs of malfunction in the prosthesis, as well as of poor fit and outgrowth. Lineal growth is more rapid than circumferential growth in a child. The baby fat of the toddler decreases and is replaced by muscle tissue, so that circumferential fit is seldom a problem. The child may wear out the prosthesis fom everyday us-

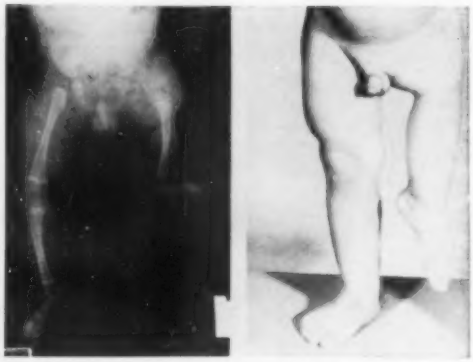

FIG. 6. The child with a phocomelia type anomaly presents a multifaceted problem. There is an absence or partial absence of the femur, no hip joint, and abnormal musculature. Stability at the site of the "hip" joint is poor and muscle power is often very weak.

age before circumferential growth necessitates changes.

The solid ankle, cushion heel (SACH) foot is used almost routinely in children's prostheses. The two most frequent malfunctions of this type of foot are: breakage in the area which would be the metatarsophalangeal joint of a normal foot, and softening of the heel cushion. When the former occurs, the toe of the foot will curl, and the child will not be able to get an adequate heel-toe transition for push-off. A heel cushion that is too soft will cause the patient to appear to be walking in a hole on the prosthetic side.

The prosthetists at CAPP fabricate lower ex-

FIG. 7. This child's tricycle was adapted so that bilateral hip extension would cause the wheels to turn. This activity aided in strengthening the hip extensors and decreasing the hip flexion contractures that were present.

tremity prostheses so that some adjustment for length, size, and shape of stump can be made. Sockets are made slightly thicker so that they may be ground out as needed. Soft socket inserts also are made thicker for the same reason. If the child is very young and wearing diapers, a special plastic is used to coat the leather work and the plastic or wood socket for easy cleaning and prevention of damage to the prosthesis.

The prosthetist can make the necessary repairs when they are reported immediately, and the child will not have to be without a prosthesis for any length of time. The members of the CAPP staff, with the aid of observant parents, try to anticipate the need for a new prosthesis, so that a prescription can be written before the old device is completely outgrown. In this way, the child is not without a prosthesis for any length of time and is not wearing a poor fitting one, which could cause him discomfort and possible deformities.

SUMMARY

There are four major areas of responsibility for the physical therapist in the treatment of the child amputee: (1) orienting the parents and the child to the prosthesis, (2) training the child to use the prosthesis, (3) preventing deformities, and (4) checking the fit and function of the prosthesis. It is important that the therapist be concerned with all four of these areas as they are interdependent. Failure to include any one area of responsibility leads to a poor treatment program.

Parents who understand the treatment goals for their child are a great help in successful treatment. Confidence in the staff comes through sharing the planning and tends to give the parents a stake in the eventual outcome. This kind of approach makes it easier for them to carry on, in the home, the treatment prescribed by the medical staff. It also aids them in looking for conditions that might lead to breakdowns in the mechanical equipment, or to the development of deformities, if not repaired promptly. Most of all, the child with an amputation remains an active member of the family while his treatment program is in progress.

The time when an infant receives his prosthesis is critical. If he receives it when he is neuromuscularly prepared for walking, he will learn to use his prosthesis more spontaneously and with less effort than if fitting had been delayed. He will not have learned to compensate with a one-legged standing pattern. The child's treatment goals can be attained much faster through the use of play activities in the treatment program, rather than through the more formalized approach characteristic of adult training.

Deformities can be prevented if parents and therapists are alert to the possibility of their occurrence. Pressure areas causing skin breakdowns, deformities necessitating surgical repair, contactures that require prolonged and often painful stretching, usually can be avoided by routine, consistent checking of the child and his prosthesis.

Immediate recognition of the need for repair and/or replacement of the prosthesis, followed by immediate action to remedy that need, will insure the child's having a prosthesis that fits well and functions effectively at all times. The physical therapist has a distinct contribution to make in the child's total treatment program, and in his general development of sound and physical and emotional patterns.

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The doctrine of human equality reposes on this; that there is no man really clever who has not found that he is stupid. There is no big man who has not felt small. Some men never feel small, but those are the few who are.—*Anon.*

When a disease has attained the crisis, or when a crisis has just passed, do not disturb the patient with innovation in treatment either by the administration of drugs or by giving stimulants. Let them be. *J. Internat. Coll. Surgeons*, 32:267, September 1959

Case Reports

Surgical Repair of a Quadriceps Tear

Robert A. Gabriel, B.S.*

A seventy-one year man was admitted to the hospital for repair of the quadriceps mechanism of the right knee. The day prior to hospitalization the patient slipped on steps and fell. Examination at that time revealed a deformity above the right patella and pain. The patient was hospitalized on October 25 for orthopedic consultation, and examination revealed that the patient had a tear of the quadriceps tendon just superior to the patella, with no other deformities.

The patient was seen by the physical therapist on the day of admittance, and the exercise program which would follow surgery and the reasons for early exercise were explained. He was instructed in straight leg-raising using the left leg.

The physical therapist was present during the surgery to observe the muscle tear and the repair. The tear, which was complete, was repaired under general anesthesia.

Sufficient soft tissue remained at the superior portion of the patella, so that the closure could be made without necessitating air holes through the patella. A cylinder cast was applied with the knee in full extension.

The patient was seen one hour postoperatively and was started on active exercises, which included straight leg-raising and quadriceps "setting." He began the exercises first using the normal left leg and then the right leg. He raised his leg, without flexion at the knee, five times with assistance and seemed to be lifting about half of the total load. The patient was seen again three and a half hours postoperatively, and could actively lift the leg off the bed 12 inches without assistance, and he could do quadriceps "setting" at will.

On the first postoperative morning the patient could lift his leg off the bed, but it was noted that he could not lift it as high as he had on the day of surgery. The patient stated he had lifted his leg ten times every hour, and at 3 A.M. he had been able to lift the leg as high as his normal left leg.

At 12 P.M. the patient came to the physical therapy department and began exercises by lifting the leg off the table twenty-five times. After ten minutes ambulation in parallel bars, he transferred to crutches, and walked a total of 1,000 feet his first postoperative day. The patient stated he had no fear of moving the leg following surgery, and had no increase in pain because of the exercising.

On the second postoperative day, the patient stated that he had trouble lifting the leg at first, but that after a few attempts he could do so easily and without pain. He began ambulating with full weight bearing on the third postoperative day and had no complaints of pain. He was discharged from the hospital the afternoon of his third postoperative day.

The patient was seen by the family physician and the cast was removed six weeks after surgery. He was seen four weeks later by the orthopedic surgeon, who found that the patient's only restriction was a lack of 10° of full knee flexion when this motion was compared to the range of the left knee.

No follow-up therapy was prescribed, because the patient showed good strength and range of motion at the time of the final orthopedic exam.

* Assistant Chief Physical Therapist, St. Nicholas Hospital, Sheboygan, Wisconsin.

The man who insists upon seeing with perfect clearness before he decides, never decides. Accept life and you must accept regret.—AMIEL

Suggestions from the Field

Dorsiflexion Footboard

Harold L. Cook, B.S.*

A footboard made according to the accompanying diagram (Fig. 1) has helped to prevent drop foot contractures in this institution.

The footboard is made of the following material: (1) The foot rest section is made of one-half inch plywood. It is 10 inches high and 23 inches long. (2) The sides are made of one-inch pine, 3½ inches high and 21 inches long, screwed to the base. (3) The base is made of one-half inch plywood. It is 21 inches long and 25 inches wide. (4) Two hinges are used to fasten the base to the footrest section. (5) Two common screen door springs 17 inches long are fastened to the footrest section and the sides.

This footboard is especially effective because it is adjustable in the following three ways: (1) to the height of the patient since it can be placed on top of the bed instead of the base being inserted under the mattress, (2) to permit total foot contact at all times by having the footrest part hinged, (3) to the amount of tension desired on the plantar flexors by spring adjustments.

As shown in Figure 2 the dorsiflexion footboard may be padded with a bath blanket or foam rubber.

* Physical Therapy Department, Abraham Lincoln Memorial Hospital, Lincoln, Illinois.

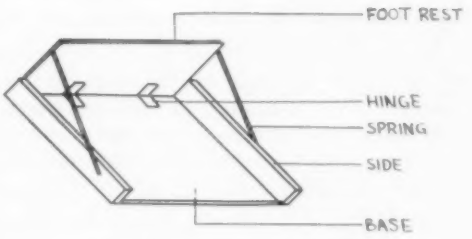

FIG. 1. Diagram of footboard.

FIG. 2. Footboard in use.

Proprioceptive Neuromuscular Facilitation Film

A 35 minute color film with sound is available to chapters and schools of physical therapy at a rental fee of $10.00. One copy of the film has been given to the Association by the California Rehabilitation Center. Requests from states east of the Mississippi should be directed to the American Physical Therapy Association, 1790 Broadway, New York 19, New York; rental is payable to the American Physical Therapy Association. Those west of the Mississippi should write to California Rehabilitation Center, 2600 Alameda, Vallejo, California; rental is payable to the California Rehabilitation Center. All requests should be submitted four weeks in advance of date of showing. Alternate dates are desirable since both copies may have prior bookings.

Editorials

Members' Rights in Physical Therapy Legislation

Where unqualified persons are permitted to practice physical therapy and, in many instances, without a physician's direction, a hazard exists for the public and the name of our profession may be degraded by such practice.

A case in point occurred in one small city where in one newspaper on the same day two "physical therapists" received publicity highly unfavorable to the profession. One man was sued for having burned a patient; another was arrested and charged with the sale of stimulant and reducing aid drugs in a reducing salon. Accidental burns can occur; but the sale of drugs is no accident. Three APTA members live in this city. Can they "educate" the public to our educational and ethical standards in the face of such publicity?

This example leads us to believe that we, forty years and thirty-eight laws since the beginning of our profession, have a right to protection from from this kind of publicity. We further believe that the state has an obligation to protect its citizens from this kind of pre-emptor of our profession and our good name.

Members of this Association have other rights in physical therapy legislation. They have a right to expect that efforts are and will be directed toward enactment of physical therapy practice acts in every state and toward improving existing laws. They have a right to expect that uniformity of requirements and examinations is being continually promoted. They have a right to be informed of any legislation which affects our professional group in any state.

The Association is trying to fulfill the needs and rights of members to be identified and assured of professional status through licensure and registration. Chapters have been provided with guidance, bills have been reviewed for conformity to our educational and ethical standards and for uniformity for ease of movement from one state to another. We have published briefs of laws as they are enacted.

Beyond the enactment of physical therapy practice acts, the Association has supported financially and has participated in the development and improvement of the Licensing Test for Physical Therapists available from the Professional Examination Service of the American Public Health Association. More than 2,000 physical therapists have taken this examination since 1953, an excellent record in view of the recency of many of our laws. Twenty-three state boards or committees use or are prepared to use the Licensing Test. More than half of our members practice in these states. More than three-quarters of our active members work in the thirty-eight states where practice is regulated by law. This and other information was included in the Annual Reports as published in the September issue. The time may soon come when every member has the right to be licensed or registered by an examination which will entitle him to endorsement or reciprocity in other states, other requirements having been met.

We cannot discuss rights of physical therapists without acknowledgment of the rights of patients and the rights of physicians. Patients have a right to quality care; physicians have a right to expect quality physical therapy. Quality care and quality physical therapy can best be supplied by ethical, qualified personnel.

None of these rights are God-given to anyone. The rights of physical therapists in regard to licensure of our professional group will not be bestowed upon us by others. These are rights for which we must strive in the states through appropriate action by our chapters and our members serving the state through examining boards and committees. The enactment of enforceable laws and the enforcement of existing laws will fulfill the rights of the triad—the patient, the physician, and the physical therapist.

Letters to the Editor

The article by Margaret J. Wells, "Industrial Incidence of Soft Tissue Syndromes", refers to Codman's Exercise (page 514, Volume 41, Number 7). I would appreciate a definition of this type of exercise as the term is new to me.

ELAINE SHENSON

Consultant in Rehabilitation
Victorian Order of Nurses
Toronto, Ontario, Canada

Codman's exercises were devised by Dr. Ernest Amory Codman, an eminent Boston surgeon (1869-1940). Through Dr. Codman's book entitled "The Shoulder: Rupture of the Supraspinatus Tendon and Other Lesions in or About the Subacromial Burse," published in 1934 by Thomas Todd Company of Boston, physicians and physical therapists in the United States became familiar with these exercises and identified them as "Codman's exercises." The physical therapy school or the medical school library at the University of Toronto or the library of an orthopedic society might have Dr. Codman's book.

The most commonly used exercise attributed to Dr. Codman is the "pendulum exercise." The patient stands with his trunk flexed to the point where his affected arm hangs free. He then moves his arm in all directions: clockwise and counterclockwise, medially and laterally, forward and backward. The forward position of the trunk may permit greater range of motion of the shoulder with less pain than is possible when the patient must lift the arm against the force of gravity.

This description is not taken from Dr. Codman's book but is based on clinical instruction in 1939. A physical therapist or orthopedic surgeon who has a copy of Dr. Codman's book is invited to submit a more accurate and scholarly description to the *Review*.

Inasmuch as the *Review* reaches many persons in more than sixty foreign countries, we try to avoid provincialism of terminology. In many instances use of a physician's name in conjunction with a form of treatment "spares the words but spoils the clarity." Your request is an example of such an instance.

Subscriptions

Anyone not a member of the A. W. P. T. A. who wishes to subscribe to The "P. T." *Review* may do so by sending name and address, with $1.00 . . . The *Review* is to be a quarterly publication.—*P. T. Review*, June 1921

Editor's Note: Volume 1 (1921) contained eighty-eight pages in four issues. The March 1961 issue alone contained eighty-eight pages; Volume 40 (1960) contained 924 pages. In 1961 the member subscriber's rate is $5.00 per year. While the subscription rate is five times greater than in 1921, the volume is more than ten times larger. Thus, the *Review's* subscription to members is a rare instance of today's dollar buying more rather than less.

Correction

Typographical errors occurred in the August issue, the article entitled "Treatment of Whiplash Injuries" by Margaret Knott and Donna Barufaldi. The legend for Figure 2, page 575, should have read, "Anatomical structures related to whiplash injuries. a, posterior rectus capitis minor; b, posterior rectus capitis major; c, obliquus capitis superior; d, first cervical nerve and vertebral artery; e, atlanto-occipital ligament; g, ligamentum nuchae; h, ligamentum flavum." In several instances there are inconsistencies of spelling within the text.

Association News

Mary Ferguson, at the age of 75, died in Indianapolis on July 28, 1961. She was born in Scotland but received her professional education for nursing and physical therapy in the United States. She attended Indiana University and Columbia University and received her physical therapy preparation at the Harvard Medical School for Graduates. For many years Miss Ferguson was Director of Field Service in the Division of Services for Crippled Children in the Indiana State Department of Public Welfare until her retirement in 1956. She was a vigorous person and was identified with many professional organizations in the area of education and health. At the time of her death she held membership in the Indiana Chapter of the American Physical Therapy Association.

New Student Members

Indiana University
Janice E. Saurer

Sargent College of Boston University
Barbara J. White

United States Army
Jacqueline M. Lavin

University of Florida
Dwight Avery Ash, Jr.

University of Puerto Rico
Carmen L. Carrau-Campos Gladys M. Garcia-Bayon
Marilucy Porrata-Maldonado

University of Wisconsin
Judith Claire Anderson Virginia A. Kuehn
Lucretia A. Hotchkiss Elva M. Leitl

1961 Meeting of State Examining Committee

The Sixth Annual Meeting of State Examining Boards and Committees was held at the Palmer House, Chicago, on Monday, July 3, 1961. Sarah Johnson, president of the Connecticut State Board of Examiners for Physical Therapists, was chairman. Louise Nelson, member of the Ohio Physical Therapy Examining Committee, was temporary secretary.

Fifteen of thirty-six states having laws governing the practice of physical therapy were represented by members of their Boards or committees. These were as follows: California, Colorado, Connecticut, Florida, Illinois, Indiana, Maryland, Nebraska, North Carolina, North Dakota, Ohio, Pennsylvania, Tennessee, Virginia, and Wisconsin. Eight of these states paid part or full expenses for their representatives to attend the meeting. There were also twenty-four observers from twenty-two states and the District of Columbia in attendance.

Licensure and Registration—1960

Those attending received copies of the information presented in Tables I, II, and III as compiled from replies received from State Physical Therapy Examining Boards and Committees in response to a questionnaire distributed in April 1961. Replies were received from thirty-four states and revealed additional information as follows:

Foreign-trained Physical Therapists — Five states (Calif., Colo., Md., Ohio, Va.) granted licensure or registration to a total of six graduates of physical therapy schools in Canada. Of three physical therapists examined, two passed, and one failed. Four were licensed or registered by waiver under "grandfather clauses."

Nine states (Colo., Ill., Mass., N. M., N. C., Ohio, Ore., Utah, Va.) granted licensure or registration to a total of twenty-nine graduates of physical therapy schools in countries other than Canada (Australia, Denmark, England, Holland, Hungary, Ireland, Latvia, Norway, Scotland, Sweden, Switzerland, West Germany). Of ten physical therapists examined, eight passed, and two failed. Twenty-one of twenty-nine physical therapists were licensed by waiver in only three states (Colorado, New Mexico, Ohio). In addition seven physical therapists were given temporary permits in two states (Oregon, Utah).

Denial of Licensure or Registration—In thirteen states, forty-five physical therapists were de-

Table I

Licenses or Registrations Issued

State	By Examination	On the Basis of Reciprocity and Endorsement	On the Basis of Credentials* ARPT	APTA	Both	By Waiver of Examination	Total Licenses or Registrations Issued
Alaska	-	6	-	-	-	-	6
Arizona	-	-	-	-	12	-	12
Arkansas	2	2	-	-	-	-	4
California	146	-	-	-	-	-	146[a]
Colorado	34	9	-	-	-	125[b]	168
Connecticut	22[c]	1	4	-	-	11	38
Delaware	-	1	-	-	-	-	1
Florida	2	5	26	-	-	-	33
Georgia	No reply						
Hawaii	6[d]	-	-	-	-	-	6
Illinois	34	8	-	-	-	-	42
Indiana	No reply						
Kentucky	25	3	-	-	-	-	28
Maine	-	-	-	-	-	1	1
Maryland	15	10	-	-	-	-	25
Massachusetts	40	12	-	-	-	-	52
Minnesota	-	-	29	-	-	-	29
Nebraska	14	-	-	-	-	1	15
Nevada	-	6	-	-	-	-	6
New Hampshire	2	-	3	-	-	-	5
New Mexico	-	-	-	-	6[e]	-	6
New York	106	-	-	-	-	-	106
North Carolina	20	6	1	-	-	-	27
North Dakota	0	1	29[f]	-	-	-	30
Ohio	4	9	17	5	-	450[g]	485
Oklahoma	4	-	-	-	-	-	4
Oregon	-	12[h]	-	-	-	96	108
Pennsylvania	64	-	-	-	-	-	64
South Carolina	1	3	-	-	-	-	4
South Dakota	-	-	-	-	7	-	7
Tennessee	4	2	-	-	-	-	6
Utah	-	7	-	-	-	30	37
Vermont	1	-	-	-	-	-	1
Virginia	23	12	-	-	-	1	36
Washington	21	-	-	-	-	-	21
Wisconsin	74[i]	5	-	-	-	-	79
Totals 36	664	120	109	5	25	715	1,638

*ARPT is the American Registry of Physical Therapists; APTA is the American Physical Therapy Association.

a. Represents registered physical therapists. In addition three physical therapists were licensed: two by waiver of examination, one by examination.
b. Report of 1959 (year of enactment) included 97 issued by waiver of examination.
c. Includes six persons examined in 1959; certificates issued in 1960.
d. An "unassembled examination" was used.
e. On basis of educational qualifications.
f. Report of 1959 (year of enactment) included 23 issued by waiver of examination.
g. Report of 1959 (year of enactment) included 435 issued by waiver of examination.
h. Includes six one-year permits issued to foreign-trained physical therapists on basis of fulfilling APTA membership requirements. Report of 1959 (year of enactment) included 95 issued by waiver of examination.
i. Includes 27 candidates examined in 1959; licenses issued in 1960.

Table II

Failure in Licensure and Registration Examinations

State	No. Examined	Written Passed	Written Failed	Written %	Oral Passed	Oral Failed	Oral %	Practical Passed	Practical Failed	Practical %
Arkansas	2	2	0	0.0	2	0	0.0	2	0	0.0
California*	173[a]	146	27	15.6	154	7	4.3	146	27	15.6
Colorado*	37	34	3	8.0	-	-	-	-	-	-
Connecticut*	19	16	3	15.7	-	-	-	-	-	-
Florida*	2	2	0	0.0	2	0	0.0	2	0	0.0
Illinois*	37	34	3	8.1	34	3	8.1	34	3	8.1
Kentucky*	27	25	2	7.4	-	-	-	-	-	-
Maryland*	15[b]	15	0	0.0	-	-	-	-	-	-
Massachusetts*	50	40	10	25.0	-	-	-	-	-	-
Nebraska	14	14	0	0.0	-	-	-	-	-	-
New Hampshire*	2	2	0	0.0	-	-	-	-	-	-
New York	134	106	28	20.8	-	-	-	-	-	-
North Carolina*	22	20	2	9.0	-	-	-	-	-	-
Ohio	4	4	0	0.0	-	-	-	-	-	-
Oklahoma	6	4	2	33.3	-	-	-	-	-	-
Pennsylvania*	67	64	3	4.4	-	-	-	-	-	-
South Carolina*	1	1	0	0.0	-	-	-	-	-	-
Tennessee*	4	4	0	0.0	4	0	0.0	4	0	0.0
Vermont*	1	1	0	0.0	-	-	-	-	-	-
Virginia*	25	23	2	8.0	-	-	-	-	-	-
Washington*	21	21	0	0.0	-	-	-	-	-	-
Wisconsin	47	47	0	0.0	47	0	0.0	47	0	0.0
Totals 22	710	625	85	13.6	243	10	4.1	235	30	12.7

*Written Licensing Test provided by Professional Examination Service, American Public Health Association.

a. Represents registered physical therapists. In addition three physical therapists were examined for licensure; one passed, two failed.
b. Eight of fifteen physical therapists were examined by use of P.E.S. Licensing Test.

Table III

Written Examinations

Source of Examinations	No. of States*	No. Examined	No. Passed	No. Failed	Per cent of Failures	No. of States with Failures
P.E.S. Licensing Test†	16	496	441	55	11.0	9
Other sources‡	7	214	184	30	14.0	2
Totals	23	710	625	85	11.9	11

*Of 36 states where practice was regulated by law in 1960, no written examinations were given in 11 states. An "unassembled examination" was used in one state. Two states failed to report.
†Although 23 state boards and committees are prepared to use the P.E.S. Licensing Test, examinations were not given in 7 of these states in 1960.
‡Maryland is included in "P.E.S." states as well as "Other sources" states because applicants were giving a choice of examination. Eight of 15 applicants elected to take the P.E.S. Licensing Test.

nied licensure or registration. Of the forty-five physical therapists, seven were denied examination in four states and twenty-eight were denied waiver of examination under grandfather clauses in four states because of unsatisfactory educational qualifications. The remaining ten from six states were not considered eligible for endorsement or reciprocity; one of these is actually pending due to a charge of solicitation of patients.

Revocation of License or Registration—None were reported in 1960.

The minutes of the last meeting, reported in the October 1960 issue of *The Physical Therapy Review*, were read. In the minutes it was stated that the committee for the next year should work on plans for forming an organization of state examining committees.

PLAN OF ORGANIZATION

In the early spring of 1961 Dorothy Voss, Staff Liaison, sent copies of a "Proposed Plan for Organization of State Physical Therapy Examining Boards and Committees" to one member of each of the State Examining Boards or Committees. Along with this material was included the agenda for the meeting in Chicago and a list of questions based on the proposed plan which would be the basis for open discussion.

Dorothy Voss was asked to present the Proposed Plan. She pointed out the purposes of such a plan, a brief history of the meetings of the State Examining Committees and some of the main points included in the Plan.

Dorothy Fredrickson, director of the American Physical Therapy Association and chairman of the Tennessee Advisory Committee on Physical Therapy, stated that the Board of Directors of the American Physical Therapy Association agreed in principle on such a plan.

The following questions were then presented for discussion: (1) What is the need for and the purpose of such an organization? (2) What are the advantages and disadvantages of the Proposed Plan? (3) Would a completely independent organization have greater merit? (4) What are the sources for leadership in developing such an organization? (5) What are the means of financial support for any such organization?

Thelma Pendleton, secretary of the Illinois Physical Therapy Examining Committee, presented the comments from the Illinois Committee concerning each of the above questions. Throughout the course of the discussion many statements were presented both for and against such a plan of organization.

When the discussion was concluded it was suggested that the next committee should continue to collect material, to plan and to continue our meetings until we have thoroughly evaluated whether or not it is desirable or necessary to have a formally organized committee under the auspices of the American Physical Therapy Association or have an independent Board of State Examining Committees. It was also recommended to the new committee that each of the State Examining Committees or Boards be sent material concerning the above suggestion for their discussion and return their pertinent comments to the committee.

The new committee members are as follows: Louise Nelson, Ohio, Chairman; Frances Ekstam, Indiana; Lyndall Zimmerman, Illinois; Dick Hanna, Nebraska.

M. LOUISE NELSON, *Acting Secretary*

Original Papers for Conference

Members of the Association who have been working on special projects, related to physical therapy procedures: research (clinical or laboratory); reviewing results achieved with a group of patients; adaptation or application of new methods of treatment; or any other subject which will advance the profession, should plan now to report their work in San Francisco next July.

Two copies of manuscript, typed (double spaced), should be submitted to Dorothy E. Voss, Editor-in-Chief, *Physical Therapy Review*, by March 31, 1962. The *Review* Editorial Board will select papers to be read by members and has the prerogative of publishing those papers selected. Members will be notified of the Board's decision not later than April 25.

Report of Meeting

Advisory Committee on Chapter Activities

Advisory Committee to Department Professional Services

The Advisory Committees met in the National Office March 23-25, 1961.

During the past year the Departments of Professional Services and Chapter-Membership Services were merged into one operating unit. Therefore, it was appropriate for these two advisory committees to conduct all of their business in joint sessions. Furthermore, since this is also a period of introspection and evaluation of the purposes and functions of advisory committees, two short sessions were conducted with the Advisory Committee on Professional Education. Composition of a committee, the function that a committee performs, and who it serves were the major items discussed by the three committees.

At the beginning of the regular sessions the consultants in the newly formed department, Lillian Chabala and Margery Lynch, summarized their major areas of responsibility, departmental services and activities, as related to members, potential members, administrators and chapters.

Since one of the principle functions of committees is to act upon specific charges referred to them from the Board of Directors, attention was turned to their requests. Discussion of these charges centered around the assistance which could be given by committee members on APTA matters during planned regional meetings, the financing and distributing of recruitment materials, the advisability of forming a chapter professional services committee and defining its purposes and duties, and the kind of membership privileges that should be extended to foreign-trained physical therapists whose credentials have been processed and who are participating in our international program.

Ongoing projects had been part of the annual agenda for each of these committees. Revision of the Manual on Chapter Organization was a responsibility of the Advisory Committee on Chapter Activities and the revision of the publication, "Use of Non-Professional Assistants", was a Board of Directors' charge to the Advisory Committee to Department of Professional Services. The committee agreed that while both of these projects continue to have a high degree of priority, other influences indicate that action should be deferred for future intensive committee work. Therefore, recommendations regarding implementation were made to the Board of Directors.

Plans for participation in the Annual Conferences were formulated for the two sessions in which the committees are to play an active role. One is Professional Advancement Day which was planned in recognition of forty years as a professional association. The other is the Chapter Workshop, at which time representatives from chapters have an opportunity to share and exchange ideas and to glean suggestions for chapter business and activities.

At the completion of a busy three day session all committee members began to have the feeling of unity and were no longer visualizing themselves as two separate committees. There was a ready acceptance of new and changing departmental and committee responsibilities and an open mind for assisting and interpreting to chapter members the role that each must play in evolving a sound and progressive Association.

The members of these committees express appreciation for the opportunity of representing and serving the members of the APTA.

HELEN BLOOD, *Chairman*
ANN CRAIG, *Recorder*

Films of Interest

Scoliosis, The Treatment By Internal Mechanical Support Of The Malforming Spine—36 min., color, sd., Texas Industrial Film Company, Houston, Texas. Encompasses the concept of scoliosis and the surgical procedure developed by an orthopedic surgeon on the staff of the Texas Institute for Rehabilitation and Research in the Texas Medical Center.

Preparation For The Later Years: Financial Planning—30 min., b/w, sd. Dynamic Films, Inc., 405 Park Avenue, New York 22, New York. This is the first of a series of films to aid people in the middle years to think and plan earlier for a richer life in the later years.

Education

SHORT TERM COURSES FOR GRADUATE PHYSICAL THERAPISTS

Title of Course	*Sponsor of Course*	*For Details Contact*	*Dates of Course*
Cerebral Palsy	The North Carolina Cerebral Palsy Hospital Durham, North Carolina	Lenox D. Baker, M.D. Medical Director No. Carolina C. P. Hosp. Durham, North Carolina	Courses arranged according to individual need—duration 3 months
Cerebral Palsy Technics of Treatment	Children's Rehabilitation Institute for Cerebral Palsy Reisterstown, Maryland	William P. Germain Executive Director Children's Rehab. Inst. Reisterstown, Maryland	Oct. 2—Dec. 15, 1961 Jan. 8, 1962—March 23, 1962 April 9, 1962—June 22, 1962 July 9, 1962—Sept. 21, 1962 Oct. 8, 1962—Dec. 21, 1962
Theory and Technic of Treatment and Care of Neuromuscular and Musculoskeletal Disorders	Georgia Warm Springs Foundation Warm Springs, Georgia	Robert L. Bennett, M.D. Director Ga. Warm Springs Found. Warm Springs, Georgia	March 27, 1961 to June 16 or Sept. 8, 1961 Sept. 25, 1961 to Dec. 15, 1961 or Mar. 23, 1961
Technics of Neuromuscular Facilitation	California Rehabilitation Center Vallejo, California	Margaret Knott, Chief P.T. Calif. Rehab. Center Vallejo, Calif.	January 2 April 1 July 1 October 1
Graduate Physical Therapy Program	Rancho Los Amigos Hospital Downey, California	Chief Physical Therapist Rancho Los Amigos Hospital 7601 E. Imperial Highway Downey, California	2nd Monday in March to 1st Monday in Sept. 2nd Monday in Sept. to 1st Monday in March
Advanced Physical Rehabilitation Methods for Physical/Occupational Therapists	New York University Medical Center—Institute of Physical Medicine and Rehabilitation (in cooperation with New York University School of Education)	Edith Buchwald Lawton, Director, Postgraduate Education for Paramedical Personnel, New York University Medical Center, Institute of Physical Medicine and Rehabilitation, 400 East 34 Street New York 16, N. Y.	Nov. 13—Dec. 8, 1961 Feb. 5,—Mar. 2, 1962 April 30—May 25, 1962
Juvenile Amputee Prosthetics (#632)	Northwestern University Medical School	Jack D. Armold, Ph.D. Director of Prosthetic Education Northwestern University Medical School 401 E. Ohio Street Chicago, Illinois	Dec. 4-6, 1961
Lower-Extremity Prosthetics (#622)	Northwestern University Medical School	(As above)	Nov. 6-10, 1961 April 2-6, 1962 April 23-27, 1962
Upper-Extremity Prosthetics (#662)	Northwestern University Medical School	(As above)	Feb. 19-23, 1962 Mar. 5-9, 1962

Guide To Graduate Education

Any physical therapist contemplating a program of advanced study is encouraged to inquire of several colleges or universities in order to find a program compatible with his interests and needs.

A wide variety of programs is available throughout the United States and Puerto Rico. The following list is indicative only of some opportunities in the universities which offer approved courses in physical therapy.

Some areas of major study on masters'/doctoral level	*Location of course*	*For information/bulletin, contact:*
2-10	College of Medical Evangelists Loma Linda, Calif.	Keld J. Reynolds, Ph.D. School of Grad. Studies
1-2-3-4-5-7-9-10-11-12	Stanford University Palo Alto, Calif.	Rixford K. Snyder Director of Admissions
8	Division of Physical Therapy Stanford Med. Center	Marian Williams, Ph.D.
2-5-9-10-11	Grad. Div., Northern Section U. of Calif., Berkeley 4	Dean of Graduate Division
	U. of So. Calif., Los Angeles 7	
1-2-5-6-10-11-12 8	Graduate School P. T. Department	Milton Kloetzel, Dean Margaret S. Rood
	University of Colorado	
2 8 10 5-9-11	Medical Center, Denver 20 Graduate School, Boulder	A. R. Buchanan, M.D. Dorothy Hoag C. A. Maaske, Ph.D. Office of Admissions
1B-5-9-11-12	U. of Conn., Storrs	N. L. Whetten, Ph.D. Dean, Graduate School
1A-2-3-5-6-8-9-10-11-12	Grad. Sch., Northwestern U. Evanston, Ill.	Mrs. Janet L. Green Secretary for Admissions
	Indiana University	
9-11 4-5 2-10	Grad. School, Bloomington Sch. of Ed., Graduate Div. Bloomington, Sch. of Med., Indianapolis	J. W. Ashton, Ph.D., Dean H. T. Batchelder, Ph.D. Associate Dean John Van Nuys, M.D., Dean
2-5-9-10-11-12 8	*State U. of Iowa, Iowa City Children's Hosp.	W. F. Loehing, Dean, Grad. Coll. Wm. D. Paul, M.D.
2-4-5-9-10-11	University of Kansas Lawrence	John H. Nelson, Ph.D. Dean, Graduate School
	University of Maryland	
1-3-5-6-7-9-11-12 2-10	Graduate School, College Park Sch. of Med., Baltimore 1	For either: Ronald Bamford Ph.D. Dean, Graduate School
	Boston U., Boston, Mass.	
1-2 5-6	Graduate School School of Education	Edward K. Graham, Dean Donald Hayes, Registrar
1-2-3-5-9-10-11-12	University of Michigan Ann Arbor	Admissions Office, Horace H. Rackham, Sch. of Grad. Studies

1—Administration
1A—Hosp. Administration
1B—Bus. Administration
2—Anatomy
3—Chemistry
4—Education including Guidance & Counseling
5—Education
6—Guidance & Counseling
7—Human Relations
8—Physical Therapy
9—Physics
10—Physiology
11—Psychology
12—Others

* Partial credit of basic Physical Therapy program towards masters degree *if* student meets Graduate School requirements.

Some areas of major study on masters/doctoral level	*Location of course*	*For information/bulletin, contact:*
1-2-3-5-6-9-10-11 8	The Graduate School U. of Minnesota, Minneapolis	Theodore C. Blegen, Dean Mrs. Ruby M. Overmann
1A-5-9-10-11	St. Louis University St. Louis, Mo.	Robert J. Henle, S.J., Ph.D. Dean, Graduate School
1A-1B-2-3-4-5-6-9-10-11-12	Washington University St. Louis 30, Mo.	Lewis E. Hahn, Ph.D., Dean Graduate Sch., Arts & Sciences
2-3-9-10-11-12	Columbia U. New York 27 Faculty of Pure Science Morningside Heights	Prof. Marshall Kaye
1-5-6-7-11-12	Teachers' College 525 W. 120 St. New York 27	Admissions Office 525 W. 120 St. NY 27, NY
	*New York U., New York 3	
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Learning is difficult enough, unlearning and relearning is not only difficult but is opposed by habit and false pride. It is nevertheless the price to be paid if you wish to be a worthy member of a learned profession.—DAVID WHITTERIDGE, *Texas J. Med.*, 57:364, May 1961.

Abstracts

Changes in Blood Flow, Oxygen Uptake and Tissue Temperatures Produced by Therapeutic Physical Agents: III. Effect of Indirect or Reflex Vasodilatation

David I. Abramson, Y. Bell, S. Tuck, R. Mitchell, and G. Chandrasekharappa (Department of Physical Medicine and Rehabilitation and the Department of Medicine, University of Illinois College of Medicine, Chicago, Illinois), AMER. J. PHYS. MED. 40:5-13, February 1961

This study of indirect or reflex vasodilatation was done to determine whether or not the increase in cutaneous circulation produced by reflex heating causes a corresponding rise in oxygen uptake.

Reflex vasodilatation was produced in the thirteen normal male subjects by short wave diathermy applied to the abdomen and chest and by hot packs placed on both feet and thighs and on one upper extremity. Each subject was covered with a blanket except for his head and the arm under study. The heating was maintained for an average of seventy-two minutes after which the subject was covered only by a light blanket. Measurements of blood flow, temperature and oxygen uptake were taken in the unheated and uncovered arm. Rectal temperature, blood pressure and pulse rate were also recorded. The experiments were performed in a constant temperature, constant humidity room kept at approximately 24° C.

Blood flow in the hand was measured by the venous occlusion plethysmograph method. Venous samples were collected from a vein chiefly draining the superficial tissues of the hand and wrist. Temperatures were taken rectally, subcutaneously, and from the skin of the dorsum of the hand. Oxygen uptake was calculated by multiplying the readings of blood flow by the derived values for oxygen arteriovenous difference, the latter being obtained by subtracting each determination of venous oxygen content from the derived figure for arterial oxygen content.

Throughout the period of indirect heating there was a marked increase in blood flow in the hand. This increase persisted for almost an hour afterward. The temperature of the skin of the hand rose gradually and reached a peak at about fifty minutes. The subcutaneous tissue temperature also rose gradually. All temperature elevations persisted about fifty minutes after heating was discontinued. There was a small but almost consistent increase in oxygen uptake during and after heating. It was believed that this was largely because of the augmentation in the rate of flow of the heated blood raising the temperature of the tissues.

Because the significant augmentation in local circulation produced by their method of reflex heating caused only a relatively small increase in oxygen uptake, the authors conclude that indirect vasodilatation may be safely used even in the presence of an organic occlusive arterial vascular disorder.

Changes in Blood Flow, Oxygen Uptake and Tissues Temperatures Produced by Therapeutic Physical Agents: IV. Effect of Acetyl-Beta-Methylcholine Chloride (Mecholyl) by Ion Transfer

David I. Abramson, S. Tuck, R. Mitchell, Y. Bell, and G. Chandrasekharappa (Department of Physical Medicine and Rehabilitation and the Department of Medicine, University of Illinois, College of Medicine, Chicago, Illinois), AMER. J. PHYS. MED., 40:31-40, February 1961

It was the purpose of this investigation to determine the effect of mecholyl ion transfer upon the circulation and upon local oxygen uptake and temperature.

Twelve normal subjects each received mecholyl ion transfer for thirty minutes. Blood flow was measured in the forearm with a segment type of venous occlusion plethysmograph. Venous samples were collected from a superficial vein draining the same portion of the forearm. Temperature readings were taken from the rectum, the skin, subcutaneous tissue, and the muscle of the forearm. Measurements of venous oxygen content, temperature, and blood flow were taken before and after treatment.

Before the mecholyl ion transfer was done the plethysmograph, which served as the active electrode, was filled with physiological saline at a temperature of 34° C. After a fifty minute period had elapsed to permit equilibrium to occur, a final series of pretreatment measurements was taken following which a direct current was passed through the solution for thirty minutes to determine the effect of this procedure alone. Post-treatment readings were taken for the next fifty minutes after which the salt solution was replaced by a 0.2 per cent solution of mecholyl at the same temperature and the ion transfer was done. Post-treatment measurements were made at frequent intervals until control levels were approached.

The results of the study confirm previous studies showing mecholyl ion transfer to be an effective means of increasing local blood flow. Blood flow almost doubled and the response persisted for nearly an hour after treatment. Blood flow also increased when the direct current was used alone, but this was a smaller increase. Coincident with the increase in blood flow there was a small but fairly consistent rise in local oxygen uptake with mecholyl. Oxygen uptake showed very little change with the direct current alone. The temperatures of the skin, subcutaneous tissue, and muscle rose during or after both procedures but the rise was greater with mecholyl.

The authors conclude that mecholyl may be used to increase blood flow even in the presence of an impaired local circulation because the rise in oxygen uptake is insufficient to endanger tissues in which an increased oxygen need is undesirable.

Compound Fractures of the Tibia

T. J. Claffey (Department of Orthopedic Surgery, St. Vincent's Hospital, Sydney, Australia), MED. J. AUST., 1:170-171, (February 4, 1961)

The aim of fracture treatment is to restore maximum function in a minimum of time. Modern antibiotics have reduced the incidence of

bone infection with its ensuing train of chronic osteomyelitis, discharging sinuses, sequestrectomies, delayed union, non-union, and amputation. One hundred eighteen cases of compound fractures of the tibia were reviewed between 1953 and 1958. These were divided into seventy conservatively treated cases and forty-eight radically treated cases. The former were treated by wound debridement and primary wound closure, the fracture then being reduced and immobilized as if it had been a closed fracture.

The group treated radically had debridement and internal fixation. Two amputations were performed. The average length of hospital stay was 37.3 days for the conservative group and eighty-eight days for the radical group. Primary wound healing was achieved in 91 per cent of the conservative cases and 65 per cent of the radical cases. Nine per cent of the conservative cases had superficial infections and there were no cases of deep infection or osteomyelitis; 35 per cent of the radical group had infections, including 21 per cent with deep infection. Primary bone healing was achieved in less than eight months in 80 per cent of those treated conservatively and in 64 per cent of the radical group. Delayed healing occurred in 15 per cent of the conservative and 18.5 per cent of the radical cases, and non-union was present in 5 per cent of the conservative and 17.5 per cent of the radical group.

The good results achieved with the radically treated fractures were remarkable as regards leg alignment, leg length, and joint function; however, there was a high infection rate among those with severe wounds. The over-all results in the conservative group were good, but slight bossing and shortening of one-forth to one-half were not uncommon, but did not interfere with joint function. The poor results in the conservative group were better than the poor results in the radically treated cases.

Contralateral Motor Irradiation-Cerebral Dominance: Its Changes in Hemiparesis

Josef Cernacek (Bratislava, Czechoslovakia), A.M.A. ARCH. NEUROL., 4:61/165-68/172, February 1961

It has been proved repeatedly that the activity of a part of the cerebral cortex influences the homologous part of the cortex on the opposite side. In previous work, during voluntary or conditioned muscle contraction, activity in the symmetrical muscles of the opposite side of the body was demonstrable electromyographically.

This study was undertaken to further analyze this motor irradiation from the following points of view: How far is contralateral motor irradiation constant in healthy people, and what factors influence its intensity? Is there a relationship to motor dominance (handedness)? Are there any changes of motor irradiation in hemiparesis?

Electromyographic recordings of motor activity were made on twenty-one normal subjects. Contralateral motor irradiation was demonstrated in all subjects and in 326 of 420 trials. This irradiation was found exclusively or with great preponderance in symmetrical muscles of the opposite side. Differences of degree of irradiation during flexion and forced flexion, if they occurred, showed more irradiation during forced flexion. The frequency of irradiation from the dominant side was found to be significantly higher than that from the subordinate side.

Similar recordings made from eighteen mildly involved hemiparetic patients who were able to perform the desired movements showed no difference from the normal group in frequency of irradiation from an unaffected or paretic dominant side. Frequency of irradiation from the subordinate side, whether affected or not, was significantly higher than that found in the normal group.

In animal experiments, Bremer, et al showed that stimulation of a point of the cerebral cortex provokes a response in the symmetrical point of the contralateral cerebral cortex by the stimulus traversing the corpus callosum and having a facilitating influence. Thus the excitation of a cortical motor point during voluntary muscle contraction facilitates the symmetrical motor point whose activity, supported by subliminal afferent proprioceptive volleys, may elicit electromyographically detected activity in its muscle. This mechanism does not explain, however, degrees of irradiation or the frequency of irradiation from the dominant side.

When the conditions influencing crossed irradiation stated by Abuladze are applied to motor activity irradiation, the presence or degree of irradiation can be explained by the suprathreshold intensity of muscle contraction (number of myoneural units engaged) in the active extremity. Muscle contraction is stronger on the dominant side. Thus this threshold is more often surpassed and irradiation thus more frequent. Equality of irradiation in ambidexters can also be explained in these terms.

In hemiparetics, the author postulates that the cerebral lesion acts as a focus of irritation with a bilateral effect. A summation effect then raises the frequency of irradiation from the subordinate side to a significant degree. Irradiations from the dominant side are already high so they are not raised significantly by this effect.

Personality Disorganization Camouflaged by Physical Handicaps

Lester A. Gelb (Institute for the Crippled and Disabled, New York, New York), MENT. HYG., 45:207-215, April 1961

Evaluation of many physically disabled or chronically ill outpatients has uncovered many instances of serious mental disturbance which were not previously recognized. The degree of disability in many handicapped persons is enormously magnified by unrecognized mental illness. Certain neurotic individuals feel nonexistent illness a useful camouflage to cover their neurotic way of life. Actual physical disability can serve that purpose with even greater success. Freud and Ferenczi believed the disabled person withdrew love from others and transferred it to himself, thereby becoming narcissistic. Neurotic reaction to disability is only another example of the specific patient's typical way of reacting to stress situations in life. Disability may camouflage distorted neurotic sexual attitudes. In a statistical study of all the major factors associated with delayed recovery, dependency-independency ranked first. The frequent overdependency of a physically ill person is an expression of the individual's typical way of functioning. It may not be seen as neurotic because of the realistic dependency of a handicapped person which is not easily separated from neurotic pathological dependency.

A study of patients injured during both world wars showed that mental behavior following injury was often more important than the injury and it often bore little relationship to the type or extent of physical injury. The reaction of a patient com-

monly diagnosed traumatic syndrome as basically a reaction of severe anxiety or panic, from symptoms the patient incorporates into a fixed chronic defense system.

Fenichel believed a neurosis becomes superfluous when replaced by another kind of suffering. A disability may establish a new condition for a person which alters the manifestations of a neurosis, but the disability cannot cure or basically change a neurosis. It is a naive illusion that personality is necessarily purified and ennobled by suffering.

In contact with the disabled, physically normal people tend to see only the disability rather than the person with the disability. If a physically disabled person is evaluated in a brief interview a problem may not be uncovered. A multidimensional approach is usually more successful: psychosocial, medical, and vocations services providing the patient with a dynamic evaluatory and therapeutic experience.

Recent Trends in Psychiatric Research Training

David A. Hamburg (National Institute of Mental Health, Bethesda 14, Maryland). A.M.A. ARCH. GEN. PSYCHIAT., 4:215-224, March 1961

Although there is considerable interest in psychiatric research on the part of faculty and trainees and an increasing awareness of the need for training in research, very little has been done to implement training programs which stimulate research.

One reason for psychiatric research training being in its infancy may be the lack of models. It is possible that a field which is moving ahead rapidly in research is slow in communicating its research strengths to newcomers in the field.

Another reason may be the competitive economic lure of private practice. A rather subtle ideology has developed in which private practice is the expected outcome for the resident and one who is seriously interested in research often finds himself under pressure to justify his interests.

A third reason may be the lack of an atmosphere of genuine inquiry. Research thrives in a climate of curiosity, a zest for discovery, a constructive skepticism, and a pride in checking old ideas and advancing new ones.

Some efforts have been made to cope with these obstacles to psychiatric research. First, a good many departments of psychiatry are now offering their trainees encouragement to pursue research interests. Second, research has become a respectable, perhaps fashionable, aspect of a field, and the public has decided that research in the field of mental health is important. Third, a good many training centers are providing some sort of participation in research for those who are sufficiently interested. Fourth, a few training programs have undertaken systematic instruction method.

Growing out of these trends in the field of psychiatric research training are certain general recommendations, which are not definitely established but do merit serious consideration: (1) At present research training can best be done in a few training centers which value research highly, have effective models available and have a high proportion of applicants who are research prone. (2) In these research-oriented residencies, it is desirable to present a sort of core curriculum to all residents by way of training in research. The curriculum will likely include some sort of systematic instruction in research method. (3) It is unlikely that all residents in such a program should participate in research since the motivational climate of such training seems to be more satisfactory when research is presented as an opportunity rather than a requirement.

Differential Supraspinal Control of Spinal Centers

Bo E. Gernandt and Sid Gilman (Laboratory of Neurophysiology, Nat. Inst. of Neurological Diseases and Blindness, N.I.H., Bethesda, Md.), EXP. NEUROL., 3:307-324, March 1961

The Schiff-Sherrington phenomena of increased hypertonus in the forelimbs of decerebrate cats after spinal section of the thoracic-lumbar area suggested an inhibitory relationship of hindlimbs to forelimbs. A gradient of supraspinal influences along the cord has also been noted. In an attempt to isolate the factors contributing to this differential control, thirty-six cats were tested for motoneuron responses by activation of motor cortex and spinal reflex action through vestibular shocks. The results showed that cerebellar inhibitory activity was less in the lumbar cord than in the thoracic cord. After destruction of anterior cerebellum all spinal differentials were abolished and the authors were unable to demonstrate any comparable spinal gradient for facilitatory effects. The inhibitory influences of the cerebellum (supraspinal) effectively mask any propriospinal control.

The role of the neck proprioceptors was demonstrated to be both wide and powerful. Ventroflexion of 5° effectively diminished motoneuron activity following stimulation of motor cortex. These reflexes are maintained by local spinal connections since they remained unaffected by spinalization at the first cervical vertebra. A close alliance of vestibular and cerebellar influence is demonstrated by differential suppressive activity of neck proprioceptors on vestibular impulses, and suggests tonic cerebellar inhibitory effects on labyrinthine reflexes.

Ambulation Problems in Very Young Children

Ernest W. Johnson and Marvin H. Spiegel (Children's Hospital & Division of Physical Med. and Rehab., Dept. of Medicine, Ohio State University, Columbus, Ohio), J.A.M.A., 175:858-863, March 11, 1961

Delayed ambulation in young children frequently is a problem to both parents and physician. In the authors' experience, the family is more concerned with what can be done than with what is wrong, since walking is equated with normalcy in our culture. In the intellectually normal or near normal child, who is not walking by eighteen to twenty months of age, walking can be accelerated by aiding either or both balance and support.

A disabled child with a normal intellectual potential should be given an opportunity to walk at the same time as his peers who are not disabled. Even the mentally retarded child's ambulation may be accelerated with use of some of the following training aids.

If a child is unable to sit or stand, a relaxation chair, a tilt board or a stand-up table may provide the proper support leading to a development of balance. The stand-up table and tilt board should be used for gradually increasing periods during the day to reinforce the proprioceptive

tive stimuli which are necessary independently to maintain an upright posture. As the physician observes satisfactory trunk stability and balance, the next step is to home-constructed parallel bars. All these aids may be constructed by the parents from simple diagrams.

The authors believe that almost all the disabled children can be taught to walk in the parallel bars, but that strollers or walkers tend to develop abnormal patterns of posture locomotion. When balance is a problem, attempts to widen the base of a child's gait can be made by use of a weighted baby carriage or cart, or of crutches or canes.

If the primary problem is lack of support, braces are used to replace weakened muscles as joint stabilizers, but bracing should be minimal.

Properly selected wheelchairs are important locomotion aids even when braces are worn, since braces may allow only brief periods of ambulatory activity while a wheel chair permits greater independence in a larger area.

A thoroughly instructed parent is the best guarantee of good results in ambulation training. Home programs should include specific instructions concerning the activity of the child around the clock, with suggestion for positioning, feeding, play, exercises, and preambulation activities. After a demonstration of the desired activities, written instructions should be given to the parents. Frequent examination of the child is necessary since growth and neuromuscular maturation occur rapidly and require constant modification of activities, exercises and braces or appliances.

Rehabilitation Evaluation —Some Social and Clinical Problems

Jonas N. Muller (Chairman, Department of Preventive Medicine, New York Medical College, New York, New York), AMER. J. PUBLIC HEALTH, 51:409-409, March 1961

The author presents one method of evaluating disability and discusses one important use of disability evaluation as well as some of the problems encountered in applying the method. Disability evaluation gained its modern social meaning with the advent of workmen's compensation. It is still thought of, classified, and acted upon essentially as a defect with a cash value. In educating and fighting for sizable new expenditures in time, money and personnel for new rehabilitation services, there should be substantial and objective evidence of the degree to which these services are effective, and for which groups.

A set of indexes was developed related to selected, representative components of self-care—locomotion, transfer, feeding, toilet, and dressing —to measure the success of rehabilitation services prescribed for aged persons in nursing homes, a group with high mortality and low motivation and no certainty about homes to which to return. Benefit from rehabilitation is defined as performing better, relative to the untreated controls in the periodic test evaluations of disability. Four hundred patients were reviewed, with a modal age between seventy and seventy-nine years; 57 per cent were women. A team having no knowledge of the study group assignment in rehabilitation or the control population administered pretreatment disability evaluations.

Comparison of the results of the preliminary screening in the nursing home with test findings at Albert Einstein Medical Center raised sharply a general question about the validity of comparisons between evaluations carried out in different social settings. One can identify individuals who appeared incapable, on screening examination and review of nursing home records, of any self-care activity, but who exhibited fairly good responses in all the self-care activities when tested by the evaluation team. The rehabilitation team brought to the test the attitudes and goals normally expected of a clinically oriented procedure in rehabilitation. The test appeared as a challenge to the worker's rehabilitation purposes and almost as a part of the rehabilitation process. Every effort was exerted to bring out the best possible performance by the patient and to grade him so as to give maximum encouragement with an indication of anticipated optimum prognosis or potential. Clinicians need to view patients both in terms of current performance and of potential when deriving a diagnosis of disability status and developing the treatment program. The researcher must sharply separate the measurement of current performance from the prognosis for performance if he is to have a reliable testing instrument for the current state of disability.

Despite the problems exhibited by this disability evaluation and implied about others, the strong conviction remains that reliable tests of ability to function in defined situations are appropriate measures of both patient status and of the value of rehabilitation. Such measures certainly are more meaningful in identifying rehabilitation needs than earlier mechanical descriptions of disability.

Epidemiologic Considerations

A. D. Langmuir (Epidemiology Branch, Communicable Disease Center, Atlanta, Georgia), J.A.M.A., 175:840-843,

In the past five and one half years since the Salk vaccine has been available, the incidence of poliomyelitis has declined, largely because of the use of this vaccine, but poliomyelitis seems far from being eradicated. With a basically new type of poliovirus immunization—the orally administered live virus vaccine developed by Dr. Albert Sabin—entering the picture, it is pertinent to review the experience of the past five and a half years from both the practical and scientific points of view.

The degree of popular acceptance of the killed virus vaccine was overestimated in 1955 and large parts of the population still remain unimmunized or only partially protected in spite of unprecedented national publicity and large federal subsidies at the initiation of the program. Also a substantial amount of laboratory data shows that the Salk vaccine produces only serologic immunity and although it prevents paralysis, it may not influence the capacity to spread the infection. Thus it is certain that the present levels of immunization are too low and too disparate to permit us to expect elimination of the disease.

The oral vaccines have several obvious advantages over the inactivated vaccines. They can be given by mouth in a sweet syrup or candy form, thus obviating the unpleasant and awkward hypodermic syringe. They can bring substantial alimentary tract immunity as well as circulating antibodies, and thus should prevent natural reinfection and spread. Moreover, the vaccine viruses may spread to sibling, parents and others in close association with the vaccinated person, and thus provide additional immunity within the group. Use of the oral vaccine has the same basic limitation as that of

the Salk vaccine: namely, the need for repeated doses.

Four general uses of the oral vaccine have been proposed and are under study by the Surgeon General's Committee on Poliomyelitis Control: (1) community-wide immunization; (2) selected area immunization; (3) infant immunization; and (4) epidemic control.

In the immediate future, before the orally given live virus vaccines become available, the Salk-type vaccines should be used extensively. In the period after oral vaccines have become available, the author believes that there will be a sound basis for continued use of the Salk-type vaccines.

Careful planning and sound community organization will be necessary to achieve the goal of eradication of the disease, and this will require a more comprehensive effort than has been applied during the past five and a half years to the use of the Salk type vaccine.

Paroxysmal Motor Episodes as Early Manifestations of Multiple Sclerosis

Ludmila Zeldowicz (Department of Medicine, University of British Columbia, Vancouver), CANAD. MED. Ass. J., 84:937-941. April 29, 1961

Brief and recurring episodes of sudden motor deficit followed by fast recovery occur in the early stages of multiple sclerosis. Between the episodes, patients are commonly symptomless.

These episodes consist of sudden falls or sudden weakness of a single limb or simulated intermittent claudication. They are characterized by suddenness, short duration, full recovery, repetitiveness and lack of corresponding signs reflecting structural damage. In addition, there may be sensory, oculovisual and other complaints referable to different parts of the central nervous system.

The episodes of motor deficit recur for months or years before signs of obvious pathology become manifest. The episodes appear to forecast not only the occurrence of future paralysis but its location as well.

Abstracters for October

We are indebted to the following Association members for the carefully prepared abstracts that appear in this issue:

Margaret Boyce
Jean Cuthbertson
Joan Erback
Mary Jane Hayes
Edna Forward
Dorothy Kemske

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Book Reviews

The Hand: A Manual and Atlas for the General Surgeon. *By Henry C. Marble, M.D., F.A.C.A., Consulting Surgeon to the Massachusetts General Hospital. Cloth, illus., 207 pp. Philadelphia: W. B. Saunders Co., 1960. $7.00*

Dr. Marble has produced a book which he states is for "those doctors, wherever they may be, who give this first surgical care." However, it will be of considerable help to all who deal with the injured hand, be they surgeons, physiatrists, physical therapists, or occupational therapists. As Dr. Marble points out in his preface, "sometimes a medical corpsman in a remote post or on a ship must give this treatment. I want to help him." He has done this by his thorough presentation of anatomy and anatomical relationships, physiology, surgical procedures, postoperative surgical management, and the recommendations for motion. The numerous excellent pictures and illustrations alone would make this a helpful manual for all.

The chapter on the anatomy of the hand is packed with exact illustrations of bones, muscles, nerves, blood vessels, and their relationships and functions. The motion of each component of the hand is illustrated indicating at the same time the muscles accomplishing it and the nerve involved. This makes an ideal reference for the therapist who will render the postoperative care.

The chapter on applied physiology is again clean-cut in discussing the physiology of bones, muscles, circulation, nerves and the autonomic nervous system. In addition, he succinctly presents causes of muscle atrophy and a list of the types infections and injuries which affect muscles. He includes an excellent presentation of effects of the autonomic nervous system and illustrations of tests. Even the skin is considered in great detail.

The chapter on the history and the examination serves as an excellent reference for instructions on examining for sensory nerve supply, motion, and motor nerve loss, and for measuring ranges of motion. Here again illustrations make clear the procedures recommended.

Dr. Marble then divides the next two chapters into considerations of closed injuries and open injuries. In the discussion of closed injuries each condition and its management is described with great clarity and includes recommendations for beginning motion and physical therapy, and pin-points the prognosis. However, he seems not always aware of the extent of the treatment possibilities in physical medicine.

The chapter on open injuries offers a wealth of detailed information and illustrations of procedures and management for the surgeon. Here again, however, we miss an awareness of the functional outcome and the need for dynamic and intensive physical medicine to assure a successful functional result.

There is then a short chapter on splints which deals primarily with surgical fixation splints but not with the dynamic splinting for function.

The last two chapters deal with the surgical management of infections and tumors. For these, as well as for injuries, the author describes in clear, simple detail what should be done as well as what should not be done. Abundant illustrations make this manual a true atlas for all concerned with the injured hand. And, finally, there is a good index at the end of the book. This book should always be within easy reach of all who deal with the injured hand.

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Washington, D. C.

Patterns of Professional Education. *By Wm. J. McGlothlin, Vice-President, University of Louisville. Louisville, Kentucky. Cloth, 288 pp. New York: G. P. Putnam's Sons. $6.75.*

Patterns of Professional Education is a comparative study of ten fields of professional preparation. It was written by William J. McGlothlin, who is uniquely qualified to make an authentic comparison of these fields. He is now Vice-President of the University of Louisville and has held positions of responsibility with the Educational Branch of the Tennessee Valley Authority, was Associate Director of the Southern Regional Education Board, served on the National Committee for Improvement of Nursing Services, was on the Board of Directors and Commission for Accreditation of the Council on Social Work Education, and on the Council on Education of the Association of American Medical Colleges. In his present capacity as Vice-President of the University of Louisville, he has responsibility for the development of the medical and dental schools and the downtown medical center of that institution. Mr. McGlothlin is a graduate of both Furman and Columbia Universities and completed advanced work at Duke University and the University of Chicago. He taught several years at both Furman and the Tennessee Universities.

Patterns of Professional Education by William J. McGlothlin would be an excellent reference book for university teachers and administrators and also for governmental agency officials who deal with the legal aspects of accreditation for professional personnel.

The author attempts to show that professional education is becoming increasingly concerned with much broader goals than merely specific competencies. He compares professional educational programs for architecture, business administration, engineering, law, medicine, nursing, psychology, social work, teacher education, and veterinary medicine. These comparisons are made relative to recruitment, selection, curriculum, instructional methods, ethics, relationships between professional schools and the university, as well as accreditation standards and procedures.

Patterns of Professional Education deals with several different professions, but the material is presented in a style which catches and holds the reader's attention. Each professional worker will find the entire book is interesting and he will tend to complete it in lieu of reading only that portion which pertains to his particular profession.

MARY A. BLAIR
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Lansing, Michigan

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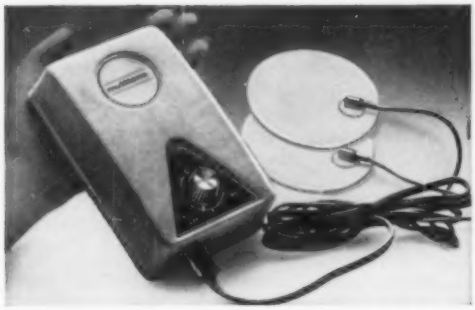
What's New

For more information on items write to The Physical Therapy Review, 1790 Broadway, New York 19, N. Y.

New items which may be of interest to physical therapists will be mentioned in these pages each month. The accompanying explanations are made by the manufacturers and have not been investigated by the *Physical Therapy Review.*

100. Multitone Stimulator



The new Multitone stimulator is a completely transistorized battery-powered generator. The device generates a double peak wave modified faradic current which can be used without discomfort. The intensity of stimulation is controlled by adjustable potentiometers. The output of the machine is interrupted forty times per minute, causing intermittent exercise of selected muscles. Weighing less than one pound, 6½ x 3½ x 2 inches unit is ideal for home treatment. The stimulator is simple to operate without hazard of electrical shock. The life of batteries with daily treatments of thirty minutes is six months. The complete unit includes an extra set of batteries. Bilton Laboratories, Inc.

101. Book Butler

The Book Butler is used in hospitals, sanitariums and veterans hospitals. Therapeutic results are achieved by use of the Book Butler. A book may be held at any angle and gives the handicapped person an independent means of reading. Reading relieves the tedium of convalescence, hastening recovery from illness. Made of lightweight aluminum tubing and steel, the device folds flat when not in use. Rehabilitation Equipment, Inc.

Occasions do not make a man either strong or weak, but they show what he is.—Thomas á Kempis

No previous civilization has ever enjoyed such a maturing, healthy population. How wonderful an asset if properly used! How tragic a liability if abused.—Bernard Baruch

To be guided in one's decisions by the present and to prefer what is sure to what is uncertain (though more attractive), is an expedient, but a narrow, rule of policy: not thus do states—nor even individual men—make their way to greatness.—Vauvenargues

Positions Available

Physical therapy practice acts have been enacted in 38 states. A listing of State Board Examinations appears in the advertising pages.

NEW ENGLAND

IMMEDIATE OPENING—Registered Physical Therapist for a general hospital of 207 beds. Paid vacation and sick leave, 40-hour week, 7 holidays. The Charlotte Hungerford Hospital, Torrington, Conn.

IMMEDIATE OPENING—For physical therapist with a minimum of one year's experience to carry out physical therapy procedures in the home. A challenging community program. Business car provided, fringe benefits. Write to Dr. Henry Greenleaf, Medical Coordinator, Greater Hartford Home Care Program, 56 Coventry Street, Hartford, Connecticut.

PHYSICAL THERAPIST—Full time position in 190-bed general hospital. Excellent working conditions with many benefits. Salary open. Apply Mount Sinai Hospital, 500 Blue Hills Avenue, Hartford, Connecticut.

POSITIONS AVAILABLE—For one registered supervisor and staff therapists. Opportunity for varied experience in rapidly expanding Physical Medicine and Rehabilitation Department in 160-bed general hospital. Excellent personnel policies. Salary open. Miriam Hospital, 164 Summit Ave., Providence, Rhode Island.

IMMEDIATE OPENING—Staff RPT for Physical Medicine Dept. In 275-bed State Chronic Disease Hospital. Located one mile from Hartford. Starting salary with no experience $154.03 bi-weekly. Low cost maintenance available. Supt. and Medical Director, Cedarcrest Hospital, Newington 11, Conn.

MIDDLE ATLANTIC

QUALIFIED PHYSICAL THERAPIST—Recent graduate accepted. Non-sectarian residential center providing intensive treatment for 40 C.P. children. Salary open, good personnel policies. August vacation, Christmas holidays. Apply: Director, Home of the Merciful Saviour, 4400 Baltimore Avenue, Philadelphia 4, Pa.

WANTED—Full time and part time staff physical therapist for suburban Philadelphia public health nursing agency. Gives consultant service to staff nurses and treatments to homebound patients. Salary range $4,602 to $5,902 depending on experience; 5 day week; 1 month's vacation; retirement plan. Apply: Mrs. Elizabeth Ann Groff; Executive Director, Community Nursing Service, Delaware County, 60 S. Lansdowne Avenue, Lansdowne, Pennsylvania.

PHYSICAL THERAPIST

For general hospital near New York City. Affiliated residency N.Y.U.-Bellevue; active physical medicine and rehabilitation program. Must be eligible for registration in New York State. Liberal benefits. Start: $4,420 with yearly increments of $290 to $5,290. Contact Personnel Supervisor, Grasslands Hospital, Valhalla, N. Y. LY 2-8500, Ext. 61.

PHYSICAL THERAPIST, REGISTERED—For outpatient Easter Seal treatment center, Nov. 1; 5 day week, 9 to 4; liberal vacation and sick leave benefits; starting salary $4,200 to $4,800 depending on experience. Apply Mrs. E. McKenna, Exec. Director, 29 Ann St., Morristown, N. J.

PHYSICAL THERAPIST—Male or female, with or without experience, licensed or eligible for licensing in New York State for large Cerebral Palsy Clinic, 30 miles from New York City. Salary commensurate with experience. Contact Miss Jean Eastman, United Cerebral Palsy of Nassau County, 380 Washington Avenue, Roosevelt, L. I., N. Y.

PHYSICAL THERAPIST—Public health; home and clinic treatments in a diversified program under a large county health department. Thirty-five hour week, liberal benefits. Must be eligible for N. Y. State licensure. Apply: Isabelle M. Clifford, Erie County Dept. of Health, 601 City Hall, Buffalo, N. Y.

STAFF PHYSICAL THERAPIST—Needed for private practice. Work in office, hospital, homes, and nursing homes. Apply to Physical Therapy Service, 16 Wikoff Pl., Red Bank, N. J.

PHYSICAL THERAPIST—Male or female, registered or eligible, for busy teaching hospital with diversified cases. Liberal benefits including free tuition NYU. Contact Personnel Department, NYU Medical Center, 420 E. 34th St., New York, N. Y.

PHYSICAL THERAPIST—With supervisory and training experience, desired at Saratoga Spa, N. Y. Must possess license in New York State. Salary range $5,320 to $6,500 per annum. Permanent Civil Service status. Director, Saratoga Springs Commission, Saratoga Springs, N. Y.

STAFF THERAPIST—for a new and expanding department in a 250-bed, fully accredited hospital. Good salary and personnel policies, no weekends, teaching optional. Write: Personnel Director, St. Vincent Hospital, Erie, Pa.

PHYSICAL THERAPIST WANTED—Excellent salary depending upon experience and training with full maintenance, if desired. A 272-bed general hospital plus a new, modern, complete physical therapy department for both inpatients and outpatients. Department under direction of physiatrist, Nathan Kaplan, M.D. Apply Dover General Hospital, Jardine Street, Dover, New Jersey, c/o C. T. Barker, Director.

STAFF THERAPISTS—For 523-bed general hospital in Manhattan. Excellent salary range and benefits. Applicants must be eligible for licensure in N. Y. State. Write E. J. Megerian, Asst. Dir. Personnel, St. Luke's Hospital, 421 W. 113 St., N. Y., N. Y.

SOUTH ATLANTIC

WANTED IMMEDIATELY—Qualified physical therapist for cerebral palsy clinic. Two weeks vacation in summer and at Christmas, sick leave and Social Security. Starting salary $4,800. Air conditioned, small center, well equipped. Contact United Cerebral Palsy of Polk County, 1243 Lakeland Hills Blvd., Lakeland, Florida.

JOB AVAILABLE—For qualified physical therapist in active community, outpatient rehabilitation center. Salary open. Apply: Miss Eleanor J. Bader, Executive Director, Delaware Curative Workshop, Inc., 16th and Washington Streets, Wilmington, Delaware.

PHYSICAL THERAPIST—Registered. Salary open, 40 hour week. Liberal employee benefits. Fully equipped, modern therapy department. Apply: Personnel Office, DePaul Hospital, Norfolk, Virginia.

THREE STAFF PHYSICAL THERAPISTS—for progressive program in 450-bed modern general hospital located in large leading federal mental hospital which is nationally recognized teaching center. Applicants must meet standards established by AMA at time of graduation or APTA if graduated prior to 1936. One year professional experience required for starting salary of $5,355. Positions in career Civil Service. Liberal vacation and sick leave, life and health insurance and retirement benefits. Hospital situated on beautiful reservation near U.S. Capitol. Opportunity for advanced education at nearby universities. Write Personnel Office, Saint Elizabeths Hospital, Washington 20, D.C.

PHYSICAL THERAPIST—Wide variety of patient treatment in rapidly expanding department. This southern medical school teaching hospital offers annual paid vacation, holidays, sick leave, modern retirement program and excellent social surroundings. Salary commensurate with ability. Write to Edith M. Vail, Physical Therapy Department, North Carolina Baptist Hospital, Bowman Gray School of Medicine, Winston-Salem, North Carolina.

STAFF PHYSICAL THERAPIST—For expanding and progressive rehabilitation program in Baltimore and Hagerstown, Maryland. Salary—Staff: $4,540 with annual increments, vacation, and sick leave. New and well equipped clinics, 40-hour week, inpatients only. Apply Dr. Florence Mahoney, Director Rehabilitation Medicine, or Miss Dorothea Barthel, Montebello Hospital, 2201 Argonne Drive, Baltimore 18, Maryland.

REGISTERED PHYSICAL THERAPIST—For the Cerebral Palsy Center of Atlanta, Inc. Day school program, clinic and outpatient services for 150 children ranging in age from 18 months to 18 years. Five-day work week, public school holidays, 2 weeks summer vacation, and sick leave. Salary open. Send qualifications to Mrs. Harold M. Seymour, Administrator. The Cerebral Palsy Center of Atlanta, Inc., 1815 Ponce de Leon Avenue, N. W., Atlanta 7, Georgia.

REGISTERED PHYSICAL THERAPIST—For new program combination public health nursing agency. Help set up program, supervise other therapists and work with staff nurses in addition to some direct therapy in the home. Five day, 40-hour week. Starting salary $4,992. Two years experience and eligibility for licensure in Virginia. Apply Director, IVNA–City Nursing Service, 223 S. Cherry Street, Richmond, Virginia.

TIRED OF SNOW? Opening September 1, 1961 for Physical Therapist in a general outpatient community treatment program including physical therapy, occupational therapy and speech therapy. Affiliated with the National Society for Crippled Children and Adults, Inc. Five day week, liberal vacation and sick leave, Blue Cross Hospitalization Plan, social security. Salary open. Apply: Mrs. David L. Black, Volunteer Director, Junior Service League Orthopedic Center, 1219 Dunn Avenue, Daytona Beach, Florida.

PHYSICAL THERAPIST—One immediately, another January 1962 in air-conditioned cerebral palsy school. Five-day week, public school holidays, 1 month summer vacation, sick leave. Salary open. Contact Mrs. A. M. Inman, Executive Director, Greensboro Cerebral Palsy School, 1601 Gatewood Ave., Greensboro, N. C.

QUALIFIED PHYSICAL THERAPIST (two) for outpatient cerebral palsy treatment center. Starting salary $4,550 per year. Two months vacation, liberal sick leave benefits. Liberal personnel policy. Contact Robert Schlitt, Director, Peninsula Cerebral Palsy Training Center, 901 24th Street, Newport News, Va.

PHYSICAL THERAPIST—New 300-bed Atlanta hospital needs additional therapist: 40 hour week, paid vacation, laundry of uniforms, sick leave, hospitalization and group life insurance. Please write giving full information on background, experience, salary desired, to Chris. J. McLoughlin, M.D., 1010 Medical Arts Building, Atlanta 8, Ga.

STAFF PHYSICAL THERAPIST—For well equipped department in 350-bed general hospital located in pleasant mountain surroundings. Salary $4,800 to $5,700 depending on experience, 40 hour week, paid vacation, sick leave and holidays. Apply: Personnel Director, Memorial Mission Hospital, Asheville, North Carolina.

WANTED IMMEDIATELY: Two (2) Staff Physical Therapists, expanding department of an orthopaedic clinic. Department under direction of a physiatrist. Vacation, sick leave, holidays. Inquire: Arthur E. White, M.D., Anderson Clinic, South 25th Street & Army-Navy Drive, Arlington, Va.

EAST NORTH CENTRAL

PHYSICAL THERAPIST—For modern general 250-bed hospital ideally located on Chicago's north shore near parks and beaches. Excellent working conditions in newly expanded physical therapy department offering separate facilities for inpatients and outpatients. Starting salary for recent graduate $440 per month plus regular increases in 6 months and annually thereafter. Liberal employee benefit program includes free Blue Cross, free life insurance, and a retirement program. For more information contact Personnel Director, Louis A. Weiss Memorial Hospital, 4646 North Marine Drive, Chicago 40, Ill.

PHYSICAL THERAPIST—for a four year old C. P. Center; starting salary $5,000-$5,500, up, plus increments, depending on training and experience. Prefer special training and/or experience in C.P.; if not C.P. trained or experienced, opportunity available for advanced training in C. P. with pay. Apply Mrs. S. L. Zieve, Coordinator, Cerebral Palsy Center, P.O. Box 294, Elyria, Ohio.

PHYSICAL THERAPY POSITIONS available in Institute Departments located in three Peoria hospitals. Excellent education opportunities, both clinical and didactic. Three weeks vacation per year, sick leave, insurance benefits, 6½ holidays per year. Complete physical medicine and rehabilitation program under supervision of physiatrist. Progressive salary scale commensurate with experience and meritorious service. Apply Medical Director, Institute of Physical Medicine and Rehabilitation, 619 N.E. Glen Oak Avenue, Peoria, Ill.

STAFF POSITION FOR REGISTERED THERAPIST —Busy department in 850-bed general hospital. Variety of cases. Many employee benefits including 3-week vacation, free laundry, free Blue Cross after one year. Living accommodations available. Contact John B. King, Director of Personnel, Presbyterian-St. Luke's Hospital, 1753 West Congress Street, Chicago, Illinois.

PHYSICAL THERAPIST for general hospital work. Completely new facilities, four therapists, University affiliation. Complete program of benefits including three weeks vacation to start. New 100-bed rehabilitation-oriented facility being developed for chronically ill. Write: Mark Slen, Assistant Administrator, Parkview Memorial Hospital, Fort Wayne, Ind.

WANTED: STAFF PHYSICAL THERAPIST—Female, graduation from approved school required. General hospital, 471-beds. Major expansion program in progress with new equipment and quarters completed for Physical Therapy Department. Salary range $4,200 to $4,800. Forty hour work week plus liberal fringe benefits. Apply Personnel Director, Butterworth Hospital, Grand Rapids 3, Michigan.

PHYSICAL THERAPIST—Challenging position for registered therapist with initiative for new pilot evaluation program for children with multiple handicaps. Experience in CP work mandatory. Work will consist of detailed diagnostic evaluation with conferences and recommendations by medical and para-medical consultants of about 2-3 patients a week, a cerebral palsy clinic once a week, and long term therapy of 14 children who attend the Therapeutic Day Nursery 3 days a week. Short term therapy for other selected children. Teaching and research contemplated in the near future. New apt. housing facilities adjacent to campus. Salary commensurate with experience. Outstanding benefits. Apply to Dr. Elizabeth Lassers, Therapeutic Day Nursery and Evaluation Center, Michael Reese Hospital, 29th St. and S. Ellis Avenue, Chicago 16, Illinois.

STAFF PHYSICAL THERAPIST—Position in 727-bed general medical and surgical Veterans Administration hospital affiliated with Indiana University Medical School. Starting salary $5,355 per annum. Yearly increases, liberal fringe benefits, hospitalization and life insurance plans available. Write Personnel Officer, VA Hospital, 1481 West 10th Street, Indianapolis, Indiana.

STAFF PHYSICAL THERAPIST—For 400-bed private general hospital with large active volume outpatient department. Liberal salary range and employee benefits. May be experienced or recent graduate. Licensed in Wisconsin or eligible to take license examination. Well-equipped, air-conditioned department. Excellent working conditions in one of midwest's foremost institutions. Centrally located in city and convenient to outstanding residential and shopping facilities. Contact Personnel Director, Milwaukee Hospital, 2200 W. Kilbourn Ave., Milwaukee 3, Wisconsin.

PHYSICAL THERAPIST—For exceptionally well-equipped, air-conditioned physical medicine and rehabilitation department. Wide variety of in- and outpatient treatment. Excellent starting salary; 40 hour week; liberal benefits; 380-bed general hospital. Contact: Dr. Edward P. Reese, Director, Department of Physical Medicine and Rehabilitation, Lutheran Hospital, 2609 Franklin Blvd., Cleveland 13, Ohio.

MUNICIPAL HOSPITAL of 708 beds needs two registered physical therapists (male and female) for expanded outpatient and inpatient program with wide variety of cases. Liberal personnel policies, 40 hour week, 2 weeks vacation, and sick leave. Write to R. E. White, Personnel Office, Hurley Hospital, Flint 2, Michigan.

REGISTERED STAFF PHYSICAL THERAPIST—For well established department in 350-bed voluntary general hospital. Wide variety of cases. Above average starting salary. Air-conditioned department. Five day work week. University city of 80,000. Apply Decatur and Macon County Hospital, Decatur, Ill.

WANTED—Male or female staff physical therapist for department of Physical Medicine and Rehabilitation in 600-bed general hospital. Forty-hour week, 3 weeks vacation, sick leave, insurance and retirement program, and other outstanding benefits. Write: Dr. Herman J. Bearzy, Miami Valley Hospital, Dayton 9, Ohio.

Job Opening

DANE COUNTY CIVIL SERVICE

Madison, Wisconsin

Physical therapist II (male or female). Salary range $384 to $444 per month, including cost-of-living bonus. Requirements: Completion of four year college or university and approved course in special therapy; also, one year professional experience in therapy. Applications are available in the office of the County Clerk, Madison, Wisconsin, and must be filed there. Otto Festge, Dane County Clerk, Madison, Wisconsin.

PHYSICAL THERAPIST—To work in cerebral palsy treatment center, major case load with young children. Under medical supervision, plus all consultative services. Salary range $5,450 to $6,250. Well established personnel policies, position covered by Social Security. Work-year is 10½ months. Additional training in specialty available after one year. Write Executive Director, Detroit Cerebral Palsy Center, 261 Brady, Detroit 1, Michigan.

REGISTERED PHYSICAL THERAPIST OR CERTIFIED—Excellent opportunity to participate in interdisciplinary team of physicians, physical, occupational, speech and music therapists. Adult outpatient rehabilitation facility in hospital setting. Liberal personnel policies. Salary open. Apply Administrator, Mary Free Bed Guild Children's Hospital and Orthopedic Center, 920 Cherry St., SE Grand Rapids 6, Michigan.

PHYSICAL THERAPIST I

$5,912 to $6,452 per year, effective August 28, 1961. New 500-bed general hospital. Liberal fringe benefits. Must be United States citizens, not past 60th birthday, graduate of approved school of physical therapy. Wayne County Civil Service Commission, 628 City-County Bldg., Detroit 26, Michigan, WO 5-2750, Ext. 261.

STAFF PHYSICAL THERAPIST—In a comprehensive multi-disability rehabilitation center serving both children and adults. Work under supervision of chief physical therapist and in conjunction with rehabilitation team including medicine, physical therapy, occupational therapy, social services, psychological and vocational services. Salary: $4,800-$5,800; can start above minimum depending upon qualifications. Apply to: David S. Shelton, Chief Physical Therapist, The Rehabilitation Center, 3701 Bellemeade Avenue, Evansville 15, Indiana.

LUTHERAN GENERAL HOSPITAL—Has immediate opening for a staff physical therapist (female). Existing new 316-bed general hospital in future medical center, located in progressive northwest suburb of Chicago, Illinois. Attractive, comfortable living quarters nearby. Young, active medical staff. Paid holidays and vacation, 40 hour week, retirement program. Salary open. Apply: Personnel Department, Lutheran General Hospital, 1775 Dempster, Park Ridge, Illinois.

PHYSICAL THERAPIST—Easter Seal Center Nursery School, most Cerebral Palsy children. Paid 5 week summer vacation, salary $4,800-$6,000. Reply to: Mrs. Clem Riddle, Executive Secretary, 299 Madison Ave., Youngstown, Ohio.

EAST SOUTH CENTRAL

PHYSICAL THERAPIST—for department in 65-bed JCAH Hospital located on college campus, department established in Jan. 1960, all new equipment—very complete. Contact Administrator, Berea College Hospital, Berea, Kentucky.

WANTED—Qualified physical therapist for expanding outpatient rehabilitation center, treating both adults and children, 40 hours, 5 day week. Salary range $4,500 to $6,000. Contact L. O. Dees, Rehabilitation Center, 316 Longwood Drive, S. W., Huntsville, Alabama.

PHYSICAL THERAPIST—Needed for 180-bed new, completely air-conditioned hospital. Starting salary $400 per month, excellent chance for advancement, 40 hour week, vacation, sick leave, insurance, retirement plan, and other benefits. Write or call Lister L. Tuck, Administrator, Singing River Hospital, Pascagoula, Miss.

REGISTERED PHYSICAL THERAPIST—For 110-bed hospital, new department. Salary dependent on experience. Two weeks vacation, holidays, sick leave. Progressive community. Contact Administrator, W. C. Byers, Jennie Stuart Hospital, Hopkinsville, Kentucky.

WEST NORTH CENTRAL

WANTED—PHYSICAL THERAPISTS

For physical therapy department which is part of a general hospital in St. Louis, Mo. Service under the direction of a full time physiatrist. Good starting salary, fringe benefits, 40 hour week. Reply to: Box 1, Physical Therapy Review, 1790 Broadway, New York 19, New York.

PHYSICAL THERAPISTS—Beginning rate $5,040 per annum. Vacations, sick leave, holidays, insurance, professional laundry and other benefits. New 120-bed rehabilitation center offering complete services to rehab patients and patients from the Acute Adult and Children's wings of main hospital. Work under the direction of two physiatrists. Inquire Personnel Department, Iowa Methodist Hospital, Des Moines, Iowa.

WANTED IMMEDIATELY—Registered physical therapist (male or female) for expanding orthopedic clinic. Will consider recent graduate. Good starting salary. Apply: Mrs. J. Cowl, Director, Laredo Rehabilitation Center, 400 Arkansas, Laredo, Texas.

STAFF PHYSICAL THERAPIST—(female) To work in modern 425-bed general hospital. In- and outpatient work, 40 hour week. Paid Blue Cross hospitalization, good life insurance and retirement plan. Write to Personnel Director, St. Mary's Hospital, Duluth, Minnesota.

MOUNTAIN STATES

ARIZONA OPENING—As Staff Physical Therapist with twenty three doctors in private medical clinic. Starting salary $350-$450, depending on experience. Write to Walter McCarrell, R.P.T., The Tucson Clinic, 116 North Tucson Boulevard, Tucson, Arizona.

PHYSICAL THERAPIST II—Salary range $460 to $575 per month, 40 hour week. Handicapped Children's Center with variable case load including cerebral palsy. Work in cooperation with 9 professional staff plus 2 orthopedists, 2 pediatricians and consultant psychiatrist. Twice monthly evaluation clinics. Prefer P.T. II with 2 years experience, at least one year in clinic or hospital serving children. Consider P.T. I with less experience able to move to II position when qualified. Center in modern progressive city near mountains, fine recreation, good climate. For application write to A. Benson, Co-ordinator, Montana Center for Cerebral Palsy and Handicapped Children, 1500 N. 30th Street, Billings, Montana.

PHYSICAL THERAPIST—Immediate opening in 160-bed general hospital in famous vacation area. Well established department. Write to Mr. Myron Redenius, St. Francis Hospital, Colorado Springs, Colo.

REGISTERED STAFF PHYSICAL THERAPIST—Female. General 200-bed J.C.A.H. hospital. No experience necessary. Excellent salary, 40 hour week, liberal fringe benefits. Paid vacation and sick leave, 7 paid holidays. Attractive nurses' home, room and board $43 monthly. Contact Administrative Assistant, Memorial Hospital, Cheyenne, Wyoming.

PACIFIC

SENIOR REGISTERED PHYSICAL THERAPIST — For 119-bed hospital, well equipped. Salary dependent on experience. Write: Personnel, St. Francis Hospital, Santa Barbara, Calif.

PHYSICAL THERAPISTS—($458-$556), the Alameda County, California, Health Department needs Cerebral Palsy Therapists for the treatment of Cerebral Palsied and similarly handicapped children. The requirements are: Eligibility for a valid certificate to practice as a registered Physical Therapist in California, completion of an approved curriculum in Physical Therapy, and one year of recent, full time, paid experience as a physical therapist. Address all inquiries to the Alameda County Civil Service Department, 188 12th Street, Oakland, California.

PHYSICAL THERAPIST—Southern California hospital. Excellent working conditions including fully paid health insurance, vacations, holidays, and sick leave. Liberal retirement plan plus social security. Excellent year around recreational facilities. Salary range, $4,872 to $5868. Write to San Bernardino County Civil Service, Courthouse, San Bernardino, California.

GRADUATES OF APPROVED SCHOOLS OF PHYSICAL THERAPY—Work in smog-free Orange County, California. $489 per month starting. Three weeks paid vacation, ten holidays, twelve days sick leave, free medical insurance plus other liberal benefits. Graduates may be employed after filing application for registration in California. For further information write: Orange County Personnel Department, 801-C North Broadway, Santa Ana, California.

IMMEDIATE OPENING—Located in San Francisco Bay area. Varied patient load—acute and chronic conditions. Hospital and office therapy, 38 hour week, 2 weeks vacation to start, increasing to 4 weeks after 4 years. Sick leave and health insurance program offered. Liberal salary offered depending upon experience. Hayward Rehabilitation Center, 1349 A Street, Hayward, California.

WORK IN SOUTHERN CALIFORNIA—Physical therapists needed to staff new rehabilitation service at Rancho Los Amigos Hospital. All aspects of rehabilitation of all age levels including postacute and convalescent care of respirator patients, general medical, and orthopedic disabilities and all aspects of bracing and prosthetics. In-service training program under direction of physical therapy instructor. Five-day 40 hour week, holidays, sick leave, vacation privileges, retirement benefits, with Civil Service rights. New building and most modern equipment available. Quarters available, laundry furnished. Beginning salary $5,280, annual increases. Write Chief Physical Therapist, Rancho Los Amigos Hospital, Downey, California.

GRADUATES OF APPROVED SCHOOLS FOR PHYSICAL THERAPISTS: You may now practice under professional supervision in this State pending registration with the California Board of Medical Examiners. Positions open in State Hospitals, the Veterans Home, and special schools for handicapped children. Starting salary $458, higher in some locations; liberal employee benefits; promotional opportunities. Streamlined civil service examinations twice a month in San Francisco and Los Angeles, and on request in other states near candidate's residence. Write: State Personnel Board, 801 Capitol Avenue, PT 71, Sacramento 14, Calif.

REGISTERED PHYSICAL THERAPIST—Accredited 221-bed hospital, 30-bed rehabilitation center, well equipped. Salary range $392 to $491; with experience starting salary $439, possibly $464. Living accommodations on grounds for single person, nominal charge. Vacation, sick leave, retirement. Apply Tulare-Kings Counties Hospital, Springville, California.

REGISTERED PHYSICAL THERAPIST—(man or woman) for 115-bed general hospital. Immediate opening; 5-day week, paid vacation, sick leave, 6 paid holidays. Salary dependent on experience. Must be eligible for California registration. Located resort coast village overlooking Pacific Ocean. Apply Personnel Manager, Scripps Memorial Hospital, LaJolla, California.

STAFF PHYSICAL THERAPIST—Hospital and office practice in San Fernando Valley. Salary is open. Advancement opportunities. Holidays, sick leave and vacation privileges, interesting and varied practice. Contact: Lionel I. Lieberman, 5900 Van Nuys Blvd., Van Nuys, California.

SAN DIEGO COUNTY
CRIPPLED CHILDREN'S SERVICES

Graduates—Approved schools for Physical Therapy. Positions open in special schools for handicapped children. Starting salary $507; liberal employee benefits. Temporary appointment pending California registration. Write Dept. Civil Service and Personnel, Rm. 403, Civic Center, San Diego, Calif.

Classified Rates

Effective December 1, 1961

First line—$3.00; additional lines, $2.00 each.

Closing date for insertion and cancellation is *two* months preceding (copy received by April 10 will appear in June issue). Typewrite advertisement double-spaced on separate sheet; 50 letters and spaces per line. Advertisers may arrange for blind ad code number at additional charge of $2.00. All classified ads are payable in advance with checks or money orders to the American Physical Therapy Association, 1790 Broadway, New York 19, New York.

Important

The right to reject an ad or to change wording in accordance with Association and editorial policy is retained by the publisher. Institutions or agencies placing ads must identify the director (John Doe, M.D., Medical Director) in the content of the ad or in the covering correspondence.

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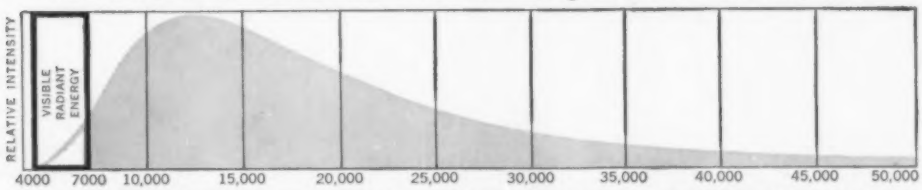
Announcing Burdick's New Infrared Lamp

New ZOALITE 500 LAMP features long-range, retractable extension arm.

The new Burdick Z-500 Lamp greatly enhances the effectiveness of infrared therapy. Its special long-life quartz tube has ideal spectral characteristics. (See chart below.) Deep penetration is assured for any part of the body.

New equipoise arm permits positioning over widest treatment table. Unique counterbalanced construction holds lamp stationary. The Z-500 also has an Alzak aluminum reflector designed to project radiation evenly over the treatment area. Hot spots are eliminated.

the heart of the new Z-500 is its quartz infrared tube



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As will be noted from the above chart, most of its radiant energy is in the range which is capable of the greatest tissue penetration.

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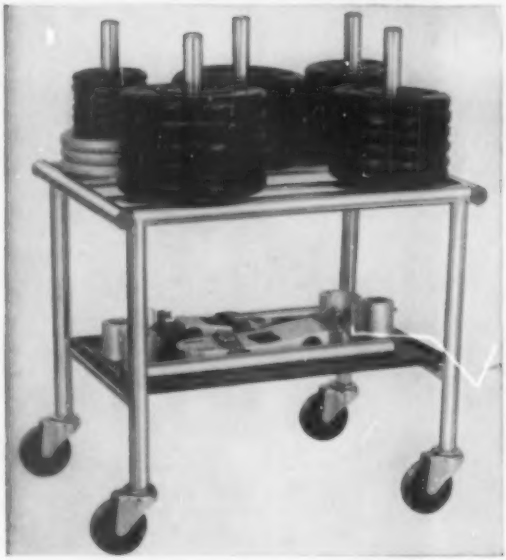

Now . . .

The Preston Weight Caddy*

Saves You

Effort • Time • Space

No more storage and transportation problems with P.R.E. weights. No more bending and carrying heavy weights by hand to the patient. No more tripping over weights on the floor: The mobile Preston Weight Caddy holds your weights at your finger tips.

The Preston Weight Caddy allows weights to be conveniently and centrally stored in any corner or closet, with a minimum of space. Yet the complete weight selection can be wheeled quickly and without effort to the treatment table. In larger treatment areas the Caddy can be easily moved from table to table as required, serving all with efficiency and economy of time and space. Holds up to 300 lbs. of weight plates in 1¼ lb, 2½ lb, 5 lb, 10 lb, and 25 lb sizes; also the small aluminum weights and miscellaneous accessories. Requires only 2 square feet of floor space.

The Preston Weight Caddy is built to seat level, the most convenient height for the administration of a weight program. It is no effort at all for the therapist, sitting on a chair or stool, to apply weights to exercise boots.

The Preston Weight Caddy moves on 3" ball-bearing heavy-duty swivel casters. Its chrome-plated tubular steel frame is attractively designed and ruggedly constructed with all welded joints. For extra sturdiness the legs are reinforced with an H-Brace. A conveniently located wooden shelf may be used to store exercise boots, bars, collars, etc.

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PC 2043 — ***Preston Weight Caddy***—on 3" ball-bearing casters with five weight holders and utility shelf, all-welded chrome-plated construction, 20½" × 15" × 26" overall height **$54.50**

Weights, if needed, must be ordered separately:

PC 2041 — Iron Weight Plates, Slotted, 1¼ lb, 2½ lb, 5 lb, 10 lb, and 25 lb. ..... per lb. **.30**

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* T M.—Design Patent applied for.

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